73 Amateur Radio Today

DECEMBER 1991
ISSUE #375
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International Edition

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QRP Transmitter

UHF/VHF Antenna

73 Reviews

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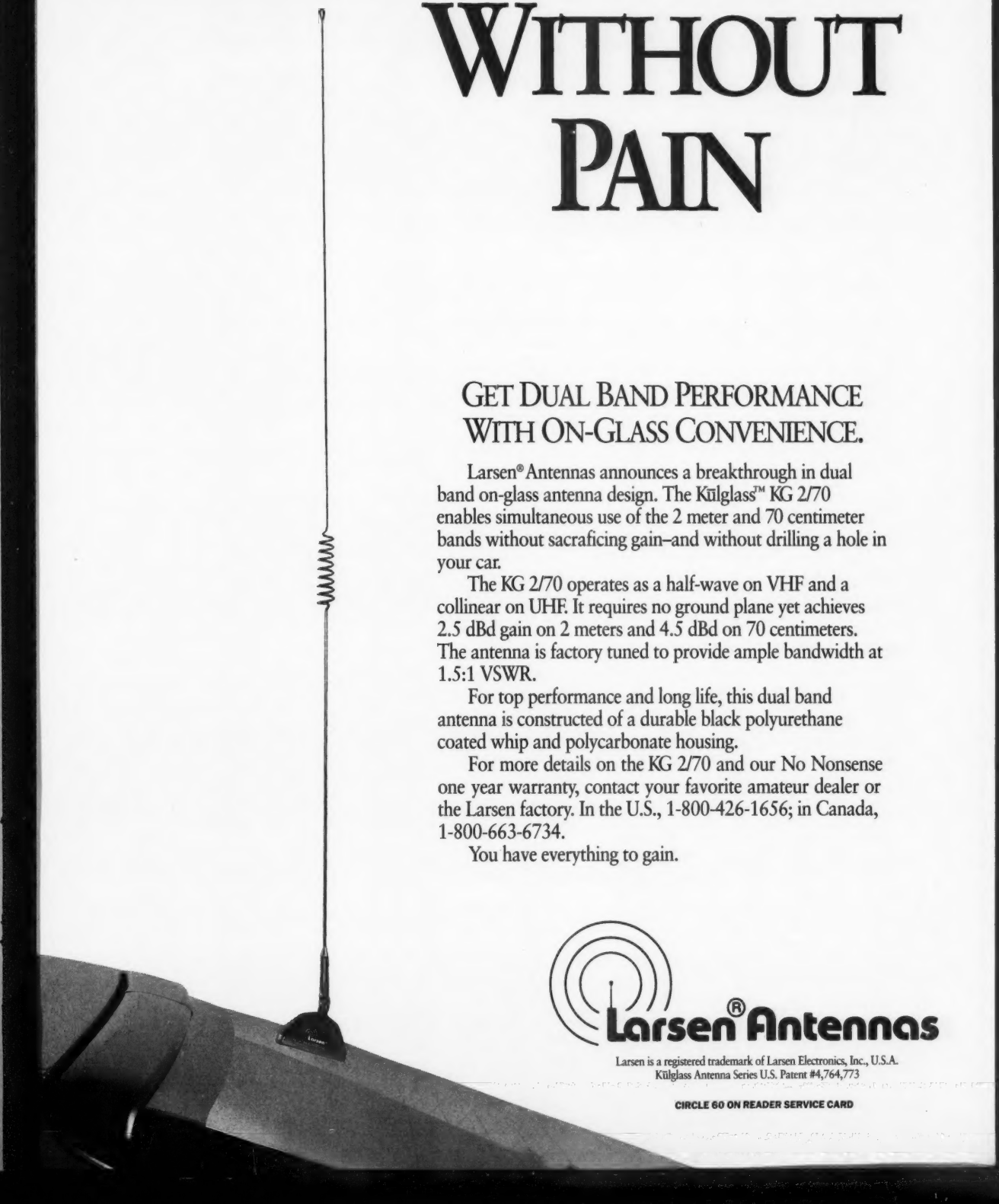

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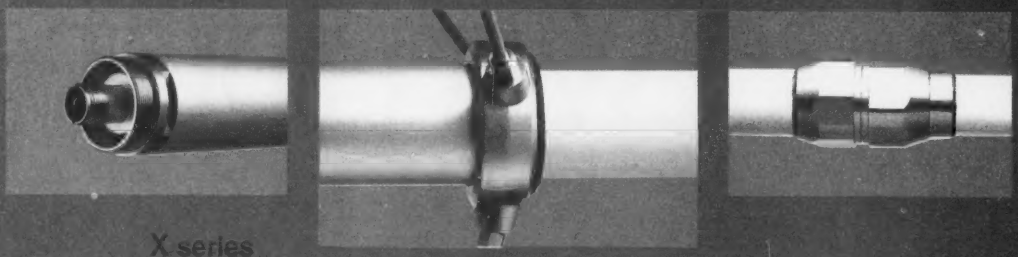

X series

X-500HNA DUAL-BAND REPEATER VERSION

X-500NA DUAL-BAND REPEATER VERSION

X-200A DUAL-BAND REPEATER VERSION

X-50A DUAL-BAND REPEATER VERSION

PART #	FREQ	GAIN(dB)	PWR(W)	LENGTH(FT)	CONNECTOR	WIND RATING	ELEMENT PHASING
X-500HNA	2m/70cm	8.3/11.7	200	17.2	N	90	2m:3-5/8λ,70cm:8-5/8λ
X-500NA	2m/70cm	8.3/11.7	200	17.2	N	90	2m:3-5/8λ,70cm:8-5/8λ
X-200A	2m/70cm	6.0/8.0	200	8.3	UHF	112.5	2m:2-5/8λ,70cm:4-5/8λ
X-50A	2m/70cm	4.5/7.2	200	5.6	UHF	135	2m:6/8λ,70cm:3-5/8λ

U series VHF/UHF MULTIBAND

U-5000A

PART #	FREQ	GAIN(dB)	PWR(W)	LENGTH(FT)	CONNECTOR	WIND RATING	ELEMENT PHASING
U-300A	70cm/23cm	8.6/13.2	150	8.3	N	110	70cm:4-5/8λ, 23cm:10-5/8λ
U-5000A	2m/70cm /23cm	4.5/8.3 /11.7	150	6.0	N	135	2m:6/8λ,70cm:3-5/8λ, 23cm:7-5/8λ

F series VHF/UHF MONOBAND

F-23A

PART #	FREQ	GAIN(dB)	PWR(W)	LENGTH(FT)	CONNECTOR	WIND RATING	ELEMENT PHASING
DP-GH62	6m	6.0	200	21.0	UHF	78	2-5/8λ
F-22A	2m	6.7	200	10.5	UHF	112	2-7/8λ
F-23A	2m	7.8	200	15.0	UHF	90	3-5/8λ
F-142A	1 1/4m	5.5	200	6.0	UHF	110	2-5/8λ
F-718A	70cm	11.5	250	15.0	N	90	18-1/2λ
F-1230A	23cm	13.5	100	10.5	N	90	25-1/2λ

*F-718L:420~430MHz,F-718J:430~440MHz

FEATURES

- WIDE-BAND performance
- VSWR 1.5:1(nom.)
- Factory adjusted, no tuning required
- Weatherproof
- Stainless steel radials & hardware
- UPS shippable
- Rugged fiberglass radome(DP-GH62 thick-wall aluminum)
- Wind speed ratings in excess of 90MPH

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Issue #375

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Cover design: David Cassidy
Cover photo: Larry Dunn

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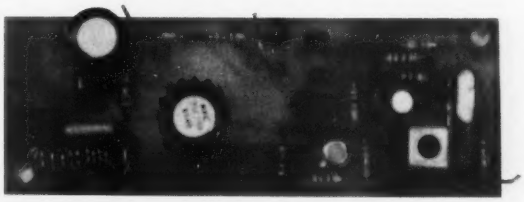
Due to space limitations, the 1991 Annual Index will appear in the January 1992 issue.

FEEDBACK... FEEDBACK!
You'll notice a feedback number at the beginning of each article and column. We'd like you to rate what you read so that we can print what types of things you like best. And then we will draw one Feedback card each month for a free subscription to *73*.



Build a TX TX... see page 10.

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Colorado/Foreign Subscribers
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Wayne Green Enterprises is a division of International Data Group.

Reprints: The first copy of an article $3.00 (each additional copy—$1.50). Write to 73 Amateur Radio Magazine, WGE Center, Forest Road, Hancock, NH 03449.

FB

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73 Amateur Radio Today (ISSN 1052-2522) is published monthly by WGE Publishing, Inc., WGE Center, Forest Road, Hancock, New Hampshire 03449.

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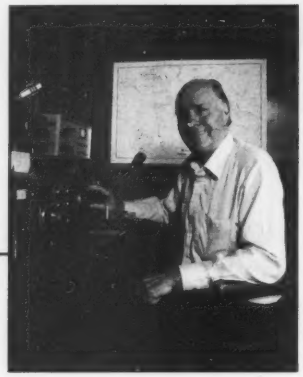
For Subscription Services write *73 Amateur Radio Today*, PO Box 58866, Boulder, CO 80322-8866, or call 1-800-289-0388. In CO call 1-303-447-9330. The subscription rate is: one year $24.97; two years $39.97. Additional postage for Canada is $7.00 and for other foreign countries, $19.00 surface and $37.00 airmail per year. All foreign orders must be accompanied by payment is US funds. Second class postage paid at Hancock, New Hampshire, and at additional mailing offices. Canadian second class mail registration number 9566. Canadian GST Registration #125393314. Microfilm Edition—University Microfilm, Ann Arbor, MI 48106. Postmaster: send address changes to *73 Amateur Radio Today*, PO Box 58866, Boulder, CO 80322-8866.

Audit Bureau of Circulations (ABC) membership applied for.

Contract: Help wanted—Elves with amateur licenses needed for 'round-the-world DXpedition on December 24th. Write to K. Kringle, Box 1, North Pole.



NEVER SAY DIE

Wayne Green W2NSD/1

Aspen '92

Anybody who has to be told twice about the Aspen Ham Colloquium in order to get him to decide to go, probably shouldn't go anyway. We don't need any wishy-washy namby-pambies clogging up the works.

The ham business is in trouble and action is needed. Yes, I said ham business. Any of you commie fellow travelers who still believe that socialism is better than capitalism have your head so far up your . . . er . . . armpit, that you need some fresh air. Non-profit? That's the ticket to bureaucracy and lousy service.

As I pointed out last month, it's this non-profit baloney which has so badly screwed up our postal "service" and our educational "system." The sooner we take these public projects private, the sooner we'll start getting some productivity. Just look at the terrible mess our non-profit ARRL has made of our hobby! They destroyed the American ham industry 25 years ago, from the manufacturers down to most of our ham stores. Now they're non-profiting away in Newington while technology is squeezing us out of our frequencies. I'll take for-profit and the merciless marketplace every time for efficiency.

When we use the capitalist system we vote every day with our dollars. And this works for every range of products, from Rolex right on down to Timex. They both keep just as good time, one's just flashier than the other. Private schools can provide better educations than public for every economic level. Once we changed to public schools in the last century our literacy rate dropped and it's never come back up to what it was.

The 16th Annual Winter Ham Colloquium will be in Aspen February 1–8th. Gonna be there, skis and HT in hand? We'll save a chair at our table for you.

Doing Something

Not everyone is sitting on their . . . er . . . laurels. I see in *EDN* that Bob KØDYH is starting a science club in Wichita to stir kids' imaginations. Where are the experimenters? "They're all around us, just waiting for the opportunity to grow," says Bob.

He's lined up mentors to help the kids learn about aviation, electronics, amateur radio, computers, photography, astronomy, and so on. The local Lions Club will help finance National Science Fair projects.

Good idea . . . so how about getting something similar started in your area? Or perhaps as an activity of your ham club?

I remember, way before I discovered amateur radio, I had a great interest in science. I read everything I could get on rockets and space travel when I was around seven years old. I'd have loved a club like that. When I was eight I got a huge chemistry (Chemcraft) set for Christmas. My grandfather even built a workbench to go with it. I had a ball with the chemistry set and built my first radios on that same workbench when I was 14.

How about it? Our kids need all the encouragement they can get. Or would you rather see them dragging their untied shoelaces around the malls, with nothing much to do but cruise? If I ever develop any job openings for experienced cruisers I'll be able to fill them a thousand times over.

Radio Therapy

A chap in New Jersey has discovered a way to ease pains, such as those from arthritis, with low frequency audio modulated radio frequencies. Since he wants to put the device on the market, he's not given any details. He says it also works on horses with pulled tendons and other pains. I'll try to find out more.

Scientists have been gently zapping cats with 2m RF, modulated at the brain frequencies in the 3–15 Hz range. The field strengths used are on a par with what we normally experience when we use our HTs. Even at these low powers the results with the test group have been markedly different from the control group.

No, they have no inkling so far as to how brains demodulate the 2m energy or why the resulting low frequencies have such a powerful effect on the performance and reinforcement of behavioral patterns of the animals. These experiments are certainly going to get me to use remote mikes with my HTs from now on . . . particularly if any sub-audible tones are being used.

This work shows how much we have to learn about the brain . . . and about the effect of electromagnetic fields on cells. It's interesting that many of these experiments are well within the resources of the average amateur, the only stumbling block being a lack of curiosity.

Electricity has been gaining ground in medicine in recent years. It's used now to help the healing of bones and soft tissue, in many cases healing bones which have been broken for many years. Transcutaneous electrical nerve stimulation (TENS) is used to reduce chronic pain. Electroacupuncture is helping the treatment of heroin and cocaine addition . . . it even helps smoking withdrawal and jet lag, and improves learning and memory.

My thanks to Dr. Adey K6UI, a leading researcher in this field, and to the newsletter of the American Institute of Stress for the above data.

DXpeditioning

As I was reading a short item in Chod's *The DX Bulletin* about a group going to Albania, it got my juices up. Lordy, what fun that'd be! Gee, I wish some of these DXpedition groups would remember poor ol' Uncle Wayne when they're deciding who they want with 'em.

Well that's my reaction . . . what's yours? Do you get the urge when you read about DXpeditions? Do you say, "Dammit, that sure would be fun!"? Or has a defective gene or irresponsible parental upbringing grounded you? Or perhaps you feel family responsibilities have permanently clipped your wings?

I don't care how busy I am or how important work is, if I get invited on a really good DXpedition, I'll have my bags packed in minutes. Should I bring along my cute little ICOM 735? How about some antennas? What else do we need? My passport is at the ready!

No, I'm probably not the fastest operator in the world . . . though I think I am and am willing to tackle the pile-ups from the DX end with anyone who wants to challenge me. I'll work those piles, right on down to the mobiles and QRP, and I'll still rack up contacts faster than anybody else with my system. I'll even try not to get testy when the Goliath Big Gun DXers insist on not waiting their turn. Aha, but will they ever get a QSL? Heh, heh. Unk Wayne is merciless with bullies.

So this group is headed for Albania and monumental pile-ups . . . and I'm sitting in New Hampshire writing this damned editorial, watching the first hints of red in the sky over Crotched Mountain as the sun starts working its way up. My barefoot 735 is sitting at my elbow, waiting . . . patiently waiting, perhaps hoping to be packed away for use in some fascinating spot.

Sure, travel is expensive. Well, it isn't anywhere near as expensive as it seems if you do some planning. Like getting an airline credit card and racking up as many free miles as you can. I use it as much as possible for company expenses, so I've got enough free miles saved up to circle the earth a few times.

Clothes? Heck, there aren't any dress codes for most DXpeditions. Oh, you don't want to look like a homeless person. Some plain old Banana Republic stuff will do fine. That's what I wear most of the time anyway.

You're probably not going to be DXing from a country with a Hyatt hotel . . . unless you're heading to Sabah, where I recommend the Kinabalu Hyatt. Great spot to visit . . . particularly if you'd like to do some diving too. The diving there is almost beyond description in terms of excitement. And one more thing, you don't even have to bring a rig . . . the local hams couldn't be more friendly, so they'll like nothing more than to let you sit at their rigs and work about 10,000 Japanese for them . . . plus maybe 5,000 Indonesians . . . if you'll handle the QSLs!

My first DXpedition was back in 1958 when six of us went to Navassa. We first planned on Clipperton. I still have the FO8AS call I got for that trip . . . finally got to use it in 1966 when I visited Tahiti, where I used FO8AA's station.

I got the call KC4AF for Navassa and we had one heck of an adventure. I've got to tell you about that sometime. We went through a hurricane and almost crashed on a reef getting there. Then we came that close to getting killed when we stopped at Haiti. You'll love the part where I have to dive in shark-infested waters to retrieve some dropped antenna elements.

That's part of the excitement of DXpeditioning. You're going to rare spots and you don't know what's going to happen. Sure, it can be dangerous, but that's part of the excitement.

Other DXpeditions can be luxurious . . . like the time I operated for a couple of weeks from King Hussein's summer palace. It doesn't get any more luxurious than that . . . complete with a king for company on a ham-to-ham basis.

Of course the burning of the American Library in Amman the day before I got there and the stoning of our embassy made walking about downtown not particularly wise. Another American ham ignored the warnings and managed to get beaten up by a couple PLO soldiers. But then he was Jewish, took pictures of the soldiers, and his wife was wearing a miniskirt . . . three very big no-nos in Jordan at the time.

I can't understand why you haven't gone on a DXpedition yet. It's fun and

Continued on page 84

KENWOOD

Compact Champion!

TH-27A/47A

2 m and 70 cm Super Compact HTs

Here is a great new addition to Kenwood's HT family – the all new TH-27A for 2 meters and TH-47A for 70 cm! Super compact and beautifully designed, these pocket-sized twins give you full-size performance.

- **Large capacity NiCd battery pack supplied.** The standard battery pack is 7.2 volts, 700 mAh, providing extended transmit time with 2.5 watts. (TH-47A: 1.5 W.)
- **Extended receive coverage.** TH-27A: 118–165 MHz; TH-47A: 438-449,995 MHz. TX on Amateur bands only, (TH-27A modifiable for MARS/CAP. Permits required. Specifications guaranteed for Amateur bands only.)
- **Multi-function scanning.** Band and memory channels can be scanned, with time operated or carrier operated scan stop.
- **Frequency step selectable for quick QSY.** Choose from 5, 10, 12.5, 15, 20, or 25 kHz steps.
- **Built-in digital clock** with programmable timer.
- **Dual Tone Squelch System (DTSS).** Compatible with the TH-26AT Series and the TM-941A Triple bander, as well as other Kenwood series transceivers, this selective calling system uses standard DTMF to open squelch.
- **Five watts output** when operated with PB-14 battery pack or 13.8 volts.
- **T-Alert for quiet monitoring.** Tone Alert beeps when squelch is opened.
- **Auto battery saver, auto power off function, and economy power mode extends battery life.**
- **DTMF memory.** The DTMF memory function can be used as an auto-dialer. All characters from the 16-key pad can be stored, allowing repeater control codes to be stored!

- **41 memories.** All channels store receive and transmit separately for "odd split."
- **DC direct in operation.** Allows external DC to be used (7.2 – 16 volts). When external power is used, the batteries are being charged. (PB-13 only.)

Optional accessories:
- **BC-14:** Wall charger for PB-13, 14
- **BC-15:** Rapid charger for PB-13, 14
- **BH-6:** Swivel mount • **BT-8:** Six cell AA Alkaline battery case • **HMC-2:** Headset with VOX and PTT • **PB-13:** 7.2 V, 700 mAh NiCd pack • **PB-14:** 12 V, 300 mAh NiCd pack • **PG-3F:** DC cable with filter and cigarette lighter plug • **PG-2W:** DC cable • **SC-30:** Soft case • **SMC-31:** Standard speaker mic • **SMC-32:** Compact speaker mic • **SMC-33:** Compact speaker mic with controls • **WR-2:** Water resistant bag.

- **Automatic offset selection (TH-27A).**
- **Direct keyboard frequency entry.** The rotary dial can also be used to select memory, frequency, frequency step, CTCSS, and scan direction.
- **CTCSS encode/decode built-in.**
- **Supplied accessories:** Rubber flex antenna, battery pack, wall charger, belt hook, wrist strap, dust caps.

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Complete service manuals are available for all Kenwood transceivers and most accessories.

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The only transceiver that could replace our best seller

The TS-450S.

Kenwood's goal is to always offer our customers the most sophisticated achievements in technology. So, when it came time to enhance our best selling TS-440S transceiver, we didn't hesitate.

The resulting TS-450S and TS-690S transceivers offer a combination of versatility, flexibility, sensitivity, and selectivity unparalleled in their price range.

The TS-450S offers competition class reception and 100 W transmission capabilities on all nine Amateur bands in SSB, CW, FM, and FSK modes, with 40 W on AM. The TS-690S also offers 50 W on six meters.

For amazingly clear reception, Advanced Intercept Point (AIP), greatly improves the receiver's dynamic range to an incredible 108 dB. An optional Digital Signal Processor, DSP-100, offers even further sound clarity by tailoring the incoming and outgoing audio passband signals.

You'll find the TS-450S and TS-690S provide truly outstanding sensitivity over the entire band. Innovative "triple conversion" also assures superior stability and accuracy, particularly above 24.5 MHz, for improved DXing.

Other refinements include: convenient split frequency operation, advanced filter functions, optional automatic antenna tuner, and 100 memory channels with flexible scanning selections.

Accessories include: **PS-33** 20.5A power supply, **PS-53** 22.5A heavy duty power supply, **SP-23** external speaker, **AT-450** internal automatic antenna tuner, **AT-300** external automatic antenna tuner, **DSP-100** digital signal processor unit, **VS-2** voice synthesizer, **SO-2** TXCO, **MB-430** mobile mount, **PG-2X** DC cable, **TU-8** CTCSS encoder, **YG-455C-1** 500Hz CW filter for 455kHz IF, **YG-455CN-1** 250Hz CW narrow filter for 455kHz IF, **YK-88S-1** 2.4kHz SSB filter for 8.83MHz IF, **YK-88SN-1** 1.8kHz SSB filter for 8.83MHz IF, **YK-88C-1** 500Hz CW filter for 8.83MHz IF, **YK-88CN-1** 270Hz CW filter for 8.83MHz IF, **YK-455C-1**, 500Hz CW filter for 455kHz IF.

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QRX . . .

EDITED BY LINDA RENEAU KA1UKM

Albania Success

The International Amateur Radio Union (IARU) team of operators/instructors returned in early October from a successful operation in Albania. The ZA1A team was given the honor of establishing amateur radio in Albania and training 12 Albanian students to carry that seed further. During the expedition over 71,000 contacts were made. Thanks to the ZA1A project, Albania is no longer a rare DX country and will continue to be active. On October 8, the ARRL DXCC desk approved the ZA1A operation for DXCC credit. The NCDXF is aiming for the shortest ever turnaround in QSLing for any major DXpedition. They started shipping out cards as of October 26. The QSL address is NCDXF, P.O. Box 1, Los Altos CA 94023. Please include two SAE/SASEs. TNX *Erkki "Eric" Heikkinen OH2BBF, Martti Laine OH2BH and Yaesu USA.*

Business on the Bands?

FCC Rule 97.113, "Prohibited Transmissions," could be changed to permit "personal business" communications, including ordering pizza by autopatch. At the recent ARRL National Convention held in Saginaw, Michigan, FCC Private Radio Bureau Chief Ralph Haller N4RH startled listeners with this proposal, which he says was in response to numerous requests from the ham community to broaden the range of amateur communications. The Commission indicated that it was open to the filing of a request for a rules change that would address certain aspects of quasi-commercial use of amateur radio spectra by hams. Among the possible changes would be: allowing hams to conduct personal and club business over amateur radio; increasing access to amateur radio for local government activities and nonprofit organizations; permitting greater latitude in the gathering and dissemination of news, even for the media, by hams through amateur radio; and permitting payments to educators who operate amateur radio stations for educational purposes. The proposal would also permit hams to retransmit other radio services, such as the Voice of America, WWV, and NOAA bulletins.

Says Haller, "As frequency managers, we feel overly bureaucratic when we have to tell you that you must not use your unused Amateur Service frequencies for non-amateur purposes. After all, the real anti-exploitation rules are those rooted in your respect for the principles for which your frequencies are made available to you, and by your good judgment." *[Unused Amateur Service frequencies?]* When traditional uses of the amateur bands are insufficient to "completely occupy all available amateur spectrum," amateurs should be allowed to use "inactive" frequencies for these almost-commercial operations. This would be on a secondary, noninterfering basis with all other amateur radio communications. These secondary communications would be limited to areas falling under FCC jurisdiction, and where international regulations do not take precedence. The question is: What are the implications of this proposal, and if such a proposal were accepted, how might it change amateur radio? TNX *W5YI Report, Vol. 13, Issue #20, Westlink Report, No. 611,* and others.

Museum Station W4BFB

On Saturday, November 2, the Amateur Radio Education Center at Discovery Place, Charlotte's Science Museum, North Carolina, opened its doors. Opening on the same day were an OMNIMAX Theatre and America's largest Spitz Space Voyager Planetarium.

Station W4BFB, under the direction of the Mecklenburg Amateur Radio Society, invites and encourages all licensed hams to use this fine equipment.

The Science Museums of Charlotte accept tax deductible contributions for the purchase of more radio equipment and station supplies. Contributions also enable them to conduct radio license classes. With a contribution of $100, your QSL card is permanently sealed in plastic and mounted on a wooden panel inside the station for all to see.

For more information, write Science Museums of Charlotte, Inc., 301 North Tryon Street, Charlotte NC 28202 or call (704) 372–6261.

Ham Arrested for Owning Ham Gear

Eric Dobrowansky KA2YKC has been indicted by a New Jersey grand jury on charges of having amateur radio gear in his car that can receive police dispatch channels, which violates New Jersey Statute A2A 124-4. The police channels are adjacent to the 2 meter band. Dobrowansky was arrested late last year by the Cranford police while trying to assist that department in its hunt for a jammer of its police radio communications. His mobile ICOM IC-901 transceiver receives on the frequencies of 136–174 MHz.

The indictment angered the New Jersey amateur radio community. New Jersey hams were already involved in a major political battle to overturn the 30-year-old law under which KA2YKC was charged. The replacement measure, New Jersey Assembly Bill A-3044, or the "Mendelsohn Law" after ARRL Hudson Division Director Stephen Mendelsohn WA2DHF who has been spearheading its passage, would make possession of mobile scanners a criminal offense only if the device was used in conjunction with the commission of a crime.

While hams in the community are deciding what to do, or have perhaps already engaged in doing some of the ideas they have thought of (picketing the P.D.? getting on "Inside Edition"? forming a motorcade equipped with banned gear and driving around town?), Eric Dobrowansky KA2YKC has refused a court plea bargain that would have permitted him to enter a no-contest plea. Instead, he has elected to demand a jury trial. He is represented by ARRL Volunteer Counsel John Norton N2IOB. If convicted, Dobrowansky faces up to a year in jail and several thousand dollars in fines, or both. TNX *Westlink Report, Number 610.*

Let's Talk Radio

A growing number of TVRO (satellite dish) listeners have been tuning in and discovering a very intriguing audio subcarrier. This audio show is called *Let's Talk Radio,* and operates every weeknight from 6 p.m. Eastern till past 2 a.m. (9 a.m. till 2 a.m. on weekends). It features live call-in discussions about amateur radio, TVRO, and shortwave listening, along with a wide array of regular talk show hosts covering just about any topic (usually between 9 p.m. and midnight). Operated by Jim Bass of Syracuse, New York, the listening audience covers most of North America! You can tune into the show by looking at Spacenet 3, channel 21 (S3-21). You'll probably see a scrambled picture, so just turn off or unhook your videocipher unit, tune into the 6.2 MHz audio subcarrier, and join in the fun.

In addition, Jim has an HF receiver at his home which he uses to uplink various amateur radio nets to the satellite subcarrier. Currently he uplinks the ATV net every Tuesday night at 9–10 p.m., various swap nets (usually between 8–9 p.m.), and the weekend TVRO HF net. Anyone who would like more information, or who would like Jim to uplink your net or special activity, should contact Jim Bass, c/o Let's Talk Radio, P.O. Box 254, Syracuse NY 13215. Or call him at (315) 673–3752.

Tropical Hamboree

Every ham is encouraged to bring a young nonham to the Youth Forum on Sunday, February 9, at the Tropical Hamboree in Miami. Carole Perry WB2MGP, famous teacher of amateur radio to young people and conductor of the Youth Forum, also needs **good speakers and presenters under 18 years of age.** Write Carole at P.O. Box 131646, Staten Island NY 10313-0006. (If necessary, you may call Carole at 718/983–1416.) For information on the Hamboree, write Chairman Evelyn Gauzens W4WYR, 2780 NW 3rd St., Miami FL 33125.

Number 3 on your Feedback card

LETTERS

From the Hamshack

Orville Gulseth W5PGG, Minnetonka MN I was thinking about sending a subscription to *73* to my grandson, who is nearly 13 years old and just getting started in ham radio. (This is the third generation of hams in the Gulseth family.) Then after I saw the picture of WK3N's QSL card on page 87 of the September 1991 issue of *73*, I decided not to. That spoiled an otherwise very good issue.

Orv, in a few months your grandson will discover girls all by himself and we'll get the subscription from him. You must have a great time censoring all his newspapers and magazines and keeping him away from the TV. Imagine what would happen if he ever saw Murphy Brown!. . . . Wayne

W.E. Beckman WA9JIE, Buffalo IL I have a problem I haven't been able to resolve and am now requesting the help of the amateur fraternity. It's the computerized equipment in my Lincoln Town car that puts out millions of harmonics, and makes a royal mess on my 10 meter HR-2600 transceiver. I haven't dared try my Icom 730.

Remedial steps included good grounding of the equipment to chassis, running RG-8/U coax directly from the car battery into the transceiver with ground strap to coax shield near both the battery and rig. No success. I have put ferrite beads on all power and speaker leads inside the rig. Still no success. (Ran out of beads and could not do the mike leads.)

With the computer chip becoming more and more prevalent in our society, more problems are going to arise. Hopefully some of the hams out there have found a tried and true way of getting rid of all this chirping in their mobile rigs and would like to pass that information on. I'd hate to have to build a Faraday cage around the darn thing; I'm hoping to find an easier solution through my fellow amateurs.

Wolfie, my Toyota Previa van is marvelously silent and handles better than the Lincoln. That's one way to cure all that hash. . . . Wayne

Mark Cronenwett KA7ULD/6, Santa Clara CA After being inactive for several years, I am very happy to see that you are still around. Your editorials are the very first part that I read then and now. I can see that things must not have changed much.

Your editorial in the September issue was great. The part about clubs was excellent. I remember when I joined the local club in Montana. At 17, I was the youngest member; the next closest was about to retire. I didn't like it much after a while.

I have no problem with heights and climbing towers, and I am also very helpful by nature. So I found myself doing a lot of tower work for all of the members of the club who suddenly found they couldn't do it for themselves.

Now I am debating about joining a club or not. I have noticed on the local repeaters that no one will talk to you if you don't belong to the club or group. I originally stopped because I was getting harassed for being a pirate station. Fortunately, that hasn't started again.

Mark, what did you get in return for climbing towers for the geriatrics, a hearty handshake? If they make it worthwhile in some way, no problem. You don't owe 'em free work. Same thing with a club. . . if it's fun, then join. It's that simple. If it isn't fun, forget 'em. And if they don't want you on their repeater, put your own on, and don't let 'em use it. No, better, send me their calls and I'll print 'em in my new Ham Hall of Shame. . . . Wayne.

Kevin KD4CNH, Key West FL I can't begin to tell you how much I enjoy your editorial in *73*. I think you speak for the majority of us new and future hams. I love the part about the fogies. It reminds me of the "I had to walk five miles to school, uphill both ways, always three feet of snow on the ground," saying. I'm an avionics technician for the Navy, and agree with you when you say most don't know what they are talking about. I just believe if you can't say good things about a person, don't say anything. If you're ever talking Florida, give me a call on 10 meters. The 2510 is always scanning! And I love to talk; but make sure you have some time to spare!

Kev, baby, if you don't have anything good to say about a person, write an editorial. . . . Wayne

Robert Dickson N4UBK Mr. Green, if it was not for your efforts, I would have been "out of there" a long time ago. Did you know that *73 Magazine* is the only ham publication in the military bookstore on Ramstein AFB, Germany? I read only *73*, beam *[?]* and *Funk Amateur*, which are excellent mags, but if I had to pick one, it would be your *73*. Keep up the hard work.

Don Norman AF8B, Elyria OH The no-code Technician license is changing amateur radio rapidly. Although a recent *QST* analysis says that 90% of new exams are for no-code, it doesn't fit my experience. Seems more like 40% of total exams to me.

Almost all no-code Techs that I have met are working on the code, and I have had two pass their 13 wpm in VE sessions I've worked.

If the hobby is to grow, we need more VE sessions. No matter where a session is held, candidates appear. I have assisted in three sessions in Gilmer County, West Virginia, and no session has had less than 10 candidates.

I suggest *73* magazine do some material on 6 meters. This was a lot of fun in the late fifties. Suppose a 6 meter rig like the Uniden 2510/2600 were available. Seems like a natural for the no-code people.

Norm, ol' boy, I've been hoping that the last ham on 6m would write something for Radio Fun *so we'd get more activity there. It's a wonderful band. . . . Wayne*

Robert A. Willingham N5UYA, Tularosa NM You *[Wayne]* inquired in your note how I had been received on the air. This is hard to quantify. I can say that nobody has been openly hostile to me; I've head a number of derogatory remarks about us "codeless Techs" voiced on the air among some of the "old-timers." They don't think we can operate correctly. Believe me: All the nonsense and bad procedure isn't just on 20 meters! I don't think most of these know-it-alls could pass a test on the FCC regulations, much less Morse code! All of my QSOs have been on 2 meters so far, and I'd say the "friendly vs. unfriendly" has been about 50-50. As I say, nobody has been openly hostile, but I've been given the brush-off more than once. I find that the other "codeless Techs" are always eager to find a friendly voice. I might add that while this part of the country is sparsely populated, we've got a lot of 2 meter repeaters available for use on the surrounding mountain tops and a couple of linked systems, one that stretches from Texas to California. The result is that I hear a surprising amount of activity in the "scan" mode.

As far as reception in other areas, that hasn't been extremely warm either. I don't have any close friends among the local amateur community, but a lot of them know me on sight and now know I am licensed. Nobody has invited me to a meeting of the local club. I went to the local hamfest a few weeks ago and mostly all who would talk to me were selling something. I did run into a guy I took the examination with and he seemed to be glad to have someone to hold a conversation with.

There was one notable exception. I walked up to the ARRL booth and introduced myself to the section manager, Joe Knight W5PDY. He extended to me what I thought was a heartfelt welcome to amateur radio. (I've heard Joe on the air a lot, on 2 meters, and running the net on HF, and I think he is a genuinely nice guy.) I guess the ARRL isn't all bad, but we knew that anyway.

In general, I think a lot of these old-timers don't realize the value to the hobby a lot of us "codeless Techs" could be. Just think of the repeaters, satellites, and other high overhead goodies our money could help finance. Your magazine might become as thick as the Japanese ham magazine you mentioned in one of your editorials. To give you a little bit of my technical background: I've operated my own two-way radio shop, ran a telephone construction company, consulted for AT&T Long Lines and Mountain Bell in the common carrier microwave area. I engineered and built a lot of the private and industrial microwave systems in the southwest. I've done a lot of broadcast engineering work, including building an FM station from the ground up in El Paso, Texas. I've had, along with all this, extensive experience in the data communications field.

No, not everybody has had the background that I have had, but just think of the computer hobbyists out there who could add their knowledge to the pool.

As far as operating on the ham bands, right now I'm confined to 2 meters. My next step is to get involved with packet. I've got an IBM compatible computer already, so all I need is a TNC. I don't know about ATV; I don't have anything worth looking at, and nobody would want to look at me! I would like to explore the microwave region and use the amateur satellites, having had a lot of experience in those areas. I've got mixed feelings about trying HF. Look at the people you have to associate with down there! I'm glad we of the sub-human species have people like you out there beating the drum for us.

Ed Libera, Jr., WT1W, Palmer MA I have been licensed for one year now, having attained the Extra class license in just under seven months.

I read *73* every month, and I find that between the articles and columns, spiced with just enough advertisements, your magazine is a very good buy for $2.95. I don't want to subscribe, however, because I like to visit the YL who runs the local newsstand.

Your editorials, I find, do illustrate some of the nonsense that I have already observed in my new-found hobby. It's an ugly thing, the fact that some hams have been operating for so many years in the same modes, on the same bands, talking to the same people about the same things. Just listen to 75 meters AM, you'll find some don't even acknowledge the existence of SSB. Then you have the politicians, schizophrenics, drunks and dopers. Why does such an enjoyable hobby attract such weirdos?

I know people who spend all their air time on either 2 meter packet or windbag repeater rag-chewing, always talking about the same things. I get sick of being told that if I buy UHF and microwave equipment I won't have anyone to talk to. Then you get these guys who hear new operators on local repeaters and yell at them rather than trying to coach them.

I have been nominated for vice president of our local club, and will probably be elected. All the older members want someone younger (I'm 33) to have a place in club management. I am sworn to get new members and educate new hams, and to get these guys to talking about things besides "my dog's cataract operation."

Kathleen Smith VE3WKW, London, Ontario I look forward to getting your magazine every month at the newsstand. I love your editorials. I find that there is a general lack of enthusiasm with our local hams when it comes to newcomers or interested prospects, so you are correct. Not much of a surprise!

I am a newcomer to the radio hobby, but it seems to me that with an army of retired hams locally, there could be some effort to push our hobby a bit and lend a hand to newcomers.

At my radio class there were only two used rigs for sale, and no accessories at all. No dealers showed up to show off new equipment or even drop off catalogs. I think that a list of used equipment could have been compiled from the local repeater or from the local ham club.

I expected a visit from the president of the local radio club to round up new members, but this opportunity was missed as well. I must admit that some members of the 2 meter club showed up and were well received, so someone is doing some thinking.

One suggestion I would make is that amateur radio students could be paired with older, more experienced hams to help them find and get their stations running. Not to mention a chance to pass on all that knowledge before it is lost to the Silent Key Patrol!

I am temporarily inactive due to an illness and financial setback that forced me to liquidate my station, but as soon as I am able, I will be back on the air. The questions still stand, though: What kind of old rig is dependable, who do I buy it from, and how do I keep it running? Better yet, who will take the time to explain?

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The Simple TX TX

The perfect companion for the SupeRX receiver!

by Bruce O. Williams WA6IVC

Ever since I introduced the Simple SupeRX (see the April 1991 issue of *73*), I meet QRPers looking for a companion transmitter at every hamfest I attend. The transmitter must have 2–3 watts output, provide reasonable performance and cost, and be suitable for portable or backpacking use with the SupeRX. It must also be able to operate on any band from 80 to 20 meters. And now it exists—the Simple Texas Transmitter (TX TX). It produces 1.5–2.5 watts on any one of four bands, is simple to build, and can be put on the air in about two hours.

After developing the Simple TX TX, I have a real sense of accomplishment. It only oscillates where it should, and it's not a particularly exotic design. It uses a basic oscillator/driver/amplifier scheme. There are a couple of improvements over the classic circuits, but by and large, it is a perfectly straightforward application of several proven circuits. Refer to Figure 1 for the schematic. Q1 is a bipolar-transistor Pierce crystal oscillator. A tuned output is desirable in a crystal oscillator to maximize power output and reduce harmonics. However, in the Simple TX TX, unlike most circuits, the resonant circuit, T1, is in the emitter of the transistor. This provides the necessary stability and purity of the signal I wanted.

I tried the microminiature 10.7 MHz IF transformer in the collector circuit initially, and attempted to take the oscillator output from the secondary of the transformer, but discovered that the output of the oscillator was too low, requiring an additional stage to drive the final amplifier. With the resonant circuit in the emitter, the output of the oscillator, taken at the collector, is about 4 Vpp, and it does not exhibit the distorted sine wave that many crystal oscillators do.

The oscillator collector voltage is regulated at 5 volts by U1, a subminiature 78L05 voltage regulator rated at 100 mA. Since the collector current of Q1 is only about 10 mA, there is little stress on the regulator. Keying is accomplished by controlling the 12 volt input to the regulator via Q4. This arrangement creates a smooth keying characteristic, without clicks or other problems.

Q2 is a conventional buffer/driver. The 2N2222A is capable of driving the final amplifier to about 1.5 watts with 12.0 volts, and over 2.0 watts with a 13.5 volt supply. Q2 is keyed with the oscillator by Q4. T2 is a wideband balun transformer that drives a conventional class C final amplifier, Q3. Because of the nearly pure sine wave output of the oscillator, the output from the PA is clean and free from distortion.

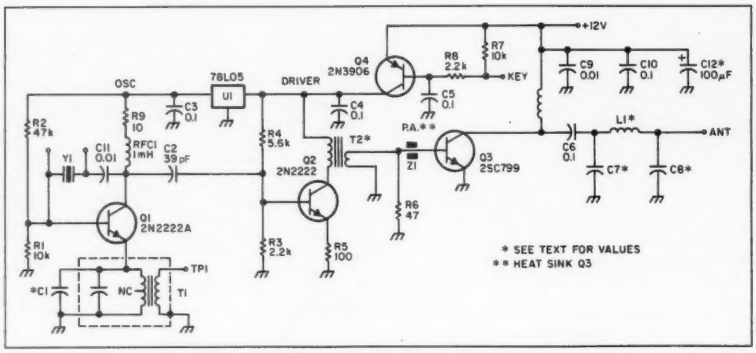

Figure 1. Schematic for the Simple TX TX.

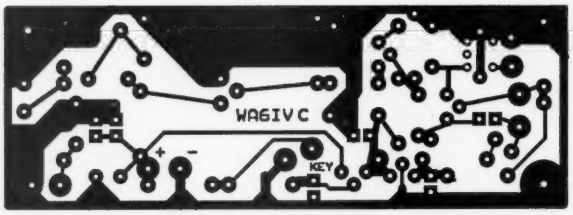

Figure 2. The PCB foil pattern.

The simple output filter (L1, C7 and C8) attenuates harmonics, but provides no impedance matching. It is taken directly from the ARRL's *Solid State Design*, a book by Wes Hayward W7ZOI and Doug DeMaw W1FB (1986). Because the output power is less than 5 watts, this filter provides sufficient filtering to meet FCC spectral purity requirements.

There are several good bipolar amplifiers available that could be used for Q3. The 2SC799 is

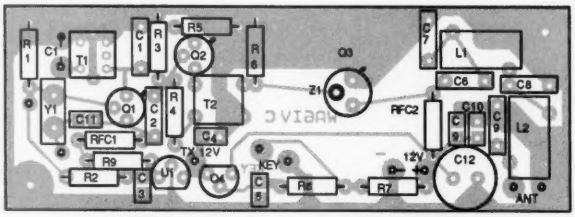

Figure 3. Parts layout for the Simple TX TX.

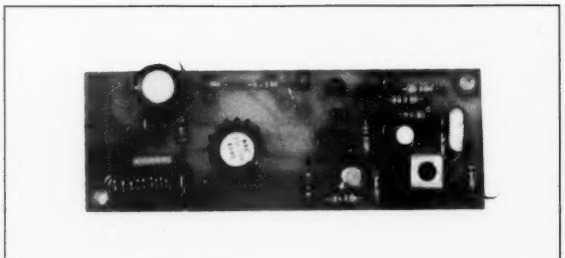

Photo. The simple TX TX.

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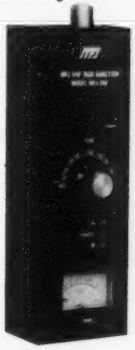

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The MFJ-247 is battery operated and handheld size so you can take it right to your antenna and work on it until it's just the way you want it. Reads SWR 160-10 Meters.

You can instantly find your antenna's true resonant frequency right at your feedline -- that's something a noise bridge just can't do.

You can monitor how SWR changes as you adjust your beam or vertical -- you'll know right away which way to adjust it.

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T2 Values

Band	Primary	Secondary
80m	5 T No. 28 enam.	1 T No. 24 enam.
40m	5 T No. 28 enam.	1 T No. 24 enam.
30m	4 T No. 28 enam.	1 T No. 24 enam.
20m	3 T No. 28 enam.	1 T No. 24 enam.

Output Filter Values

Band	C7, C8	L1
80m	750 pF	21 T No. 24 on T-50-2
40m	470 pF	14 T No. 24 on T-50-2
30m	300 pF	12 T No. 24 on T-50-2
20m	210 pF	12 T No. 22 on T-50-6

readily available at low cost. It was commonly used as an output amplifier in CB rigs, and is capable of up to about 4 watts. Of course, the 2N3866, 2N4895, RCA 4013, or any of several other TO-5 configured transistors can be used. The MRF 472 and MRF 476 are also usable with a slight change in pinout.

The Simple TX TX design is very forgiving. You can substitute parts of different values for almost any of the components shown. The only critical parts are the 10.7 MHz transformer, T1, and the output filter components. I tried several different values for RFC1 and RFC2, and the effect on performance was minimal.

Construction

I built the Simple TX TX prototypes using printed stripboard (see the table for sources of parts). This product is easy to use, and not expensive. So-called "ugly construction," or what Zack Lau KH6CP/1 now calls "ground plane" construction, is another option. I personally have never had much luck with this approach, but I know of many home-brewers who do very well using this technique. However, a printed circuit board is available at a reasonable price (see the table). Figure 2 shows the etching pattern for the circuit board, and Figure 3 shows component placement. You can get a complete circuit board kit from MXM Industries. I recommend using the available printed circuit board, since it speeds construction and makes it difficult to "garf" up the circuit.

Start your construction by installing the power supply capacitors and keying circuit components, and the 5 volt regulator, U1. Don't make the mistake of attempting to complete the entire transmitter before testing the individual circuits. Build one stage and check it out before going to the next. Troubleshooting the entire transmitter will drive you nuts, and there is a strong likelihood that you will damage some of the components in the process! After assembling the regulator and keying circuit, make sure that the output of U1 is approximately 5 volts (typically 5.02 volts), and that the keying circuit operates properly. Only after this crucial step should you continue.

Install the components of the oscillator (R1, R2, R8, T1, C1, RFC1, Q1, C2) and verify that the oscillator is operational before continuing to the buffer/driver, Q2. Tune T1 for the best sounding signal, not necessarily the signal with the most output. Check that when the oscillator is keyed there are no key clicks or other anomalies during keying. You can monitor the output of the oscillator on a ham band or general coverage receiver. If you have a frequency counter or oscilloscope, a small piece of component lead can be soldered into the board at TP1 to allow confirmation of the proper signal. Don't be surprised if the frequency of oscillation is a little above the frequency indicated on the crystal (1–2 kHz). It's easy to tune the output of the oscillator to the frequency you desire later.

Extra Adjustment for 20 Meters

T1 is a microminiature (7mm) 10.7 MHz IF transformer. To make the transformer resonant on the particular band of interest, a padding capacitor must be added across the 3-pin primary. Different values for capacitor C1 for operation on the 80, 40, 30, and 20 meter bands, respectively, is given in the parts list.

Although the value for the padding capacitor is shown as 27 pF for 20 meter operation, some modification to T1 is also required. There is a small ceramic capacitor mounted in the base of the transformer. This capacitor must be *carefully* removed before you install the transformer on the circuit board.

Carefully break the capacitor in half, using a very small, sharp X-ACTO® knife, and pull the two halves out. Do not try to pull the halves from the transformer base. First, carefully cut the leads connected to the halves, then remove the halves.

Check continuity between the two outboard pins on the 3-pin side of the transformer. If there is no continuity, the transformer must be replaced. With this capacitor removed, T1 will be resonant at 20 meters with the addition of the 27 pF capacitor as C1.

The value of 39 pF for C2 limits the output of the Simple TX TX to about 1.5 watts with a 12 volt supply. If you wish to increase or decrease the output, some experimentation with C2 will be required. I found that if the value of C2 is as high as 100 pF, both Q2 and the output transistor will exhibit extreme heating, and shortly destruct! I found that the usable upper-limit value is about 51 pF.

Winding T2

T2 is a broadband transformer wound on a

Parts List

C1	20m, 27 pF; 30m, 18 pF; 40m, 51 pF; 80m, 330 pF	silver mica or polystyrene
C2	39 pF	silver mica or polystyrene
C3,4,5,10	0.1 µF, 50V	monolithic
C6	0.1 µF, 200V	monolithic
C7,8	470 pF	silver mica
C9,11	0.01 µF, 50V	monolithic
C12	100 µF, 35V	electrolytic
D1	36V zener diode	1N4754 or equi.
Q1,2	2N2222A	
Q3	2SC799 or equi.	
Q4	2N3906	
R1,7	10k, 1/4W	carbon
R2	47k, 1/4W	carbon
R3,8	2.2k, 1/4W	carbon
R4	5.6k, 1/4W	carbon
R5	100 ohm, 1/4W	carbon
R6	47 ohm, 1/4W	carbon
R9	10 ohm, 1/4W	carbon
RFC1	1 mH	RF choke
RFC2	47 µH	RF choke
T1	10.7 MHz microminiature IF transformer	Mouser 42IF222 or 42IF223
T2	wideband balun core	BN-43-2402
U1	78L05, 5V	regulator
Y1	HC-18 crystal, 32 pF parallel	select for frequency
Z1	FB-43-201	ferrite bead

Printed stripboard may be ordered from Dick Smith Electronics/American Electronics, P.O. Box 468, Greenwood IN 46142. (800) 872–1373.

Transformers are available from Mouser Electronics, 2401 Hwy. 287 North, Mansfield TX 76063. Tel. (817) 483–4422; (800) 346–6873.

For transistors and balun cores, you may contact Danny Stevig KA7QJY, P.O. Box 7970, Jackson WY 83001. Tel. (307) 739–1634, evenings.

A drilled and plated circuit board is available from FAR Circuits (N9ATW), 18N640 Field Court, Dundee IL 60118. Price $4.50 plus $1.50 S&H.

You may also obtain a complete circuit board kit, which includes all board-mounted components and a crystal on the QRP calling frequency for the selected band, from the author at MXM Industries, Rt. 1 Box 156C, Smithville TX 78957. Tel. (512) 237–3906. Price for the complete kit with crystal is $32.95 plus $4.00 S&H. Texas residents add sales tax.

A complete transmitter/receiver kit on a single board (uses the SupeRX receiver) is available for $79.95 + $4 shipping.

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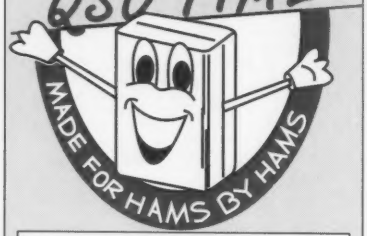

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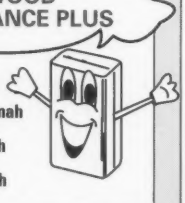

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BN-43-2402 binocular balun core. I start winding T2 by putting the secondary 1-turn winding on first—1 turn of #24 enameled wire for operation on the 80, 40, 30, and 20 meter bands—then I wind the primary over the secondary.

The turns ratio for the primary winding varies with the particular band. For 80 and 40 meters, it's 5 turns of #28 enameled wire; for 30 meters, it's 4 turns of #28 enameled wire; and for 20 meters, it's 3 turns of #28 enameled wire.

The primary leads should come out of one end of the core, and the secondary leads out of the other end of the core. The balun core is extremely small, and the holes through the core are also small. If you have to use larger size wire, you may have problems getting all the turns on. You can use a larger balun core, of course, but some experimentation with turns and turn-ratios will be required. If you don't have a binocular type of core, a broadband toroidal transformer can be substituted. *Solid State Design* gives information for using toroidal cores as broadband transformers.

Output Filter

The final power amplifier, Q3, is a straightforward configuration which you may recognize as about standard for most QRP transmitters. The value of RFC2 is not very critical. I have tried values from 15 µH to 1 mH with little effect on performance. I found that the 1 mH value reduces the output a little, just because of the additional resistance of the winding in the higher value. Values from 25 to 100 µH will work fine. D1 is a 36 volt zener diode that protects Q3 from damage in the event an antenna is not connected when the transmitter is keyed.

Testing and Operation

If you have followed my suggestions about assembling each stage separately, by the time you finish construction, the transmitter will be ready to use. A few preliminary tests are a good idea, however. NEVER test the transmitter without a dummy load (of at least a 5 watt rating). If you don't have a suitable dummy load, you can construct one by placing three 150 ohm, 2 watt resistors in parallel, or by using any number of combinations. Although I have a 10–1000 watt dummy load, I generally use a small, calibrated SWR/wattmeter with a home-built dummy load. I find that my commercial dummy load/wattmeter is poorly calibrated at low power levels, showing less than a watt when the actual power is over 1 watt. One sure way to get a good estimate of output power is with an oscilloscope.

It is essential, even at low power levels, to use a heat sink on the final amplifier. In fact, it may be a good idea to put a heat sink on Q2, since it does carry a heavy burden in this design. Although during tune-up the final amplifier may seem to be running cool, when it is mounted in a cabinet, the circulation of the cooling air may be impaired. In the same vein, be sure to install a ferrite bead, Z1, on the base lead of the final amplifier.

It is possible to VXO the crystal a little by placing a capacitance across it. Don't expect too much of a shift, however. Maybe just 2–3 kHz. Remember that the tuning capacitor must be isolated from ground. I use a DPDT switch with a center OFF position, and connect the two center connections across the crystal. In the center OFF position, no capacitance appears across the crystal, and the frequency will be whatever the crystal generates. I placed two capacitors across the other two poles, so that if the switch is in one position, that capacitor controls the frequency, and if it's in the other position, the second capacitor controls the frequency. If you can't get the frequency where you want it with a fixed capacitor, there is room on the switch to mount a small variable capacitor to fine-tune it.

Good luck with your Simple TX TX! The project is so simple that you should not experience any major difficulties. If the darned thing doesn't operate right off, check your wiring for solder bridges, and see that the components are in the right place. With the Simple SupeRX, no problems have been reported to me apart from two isolated part failures not the fault of the design. If you think you have a problem that I might be able to help you with, or if you just want to talk about it, please do not hesitate to write or even call.

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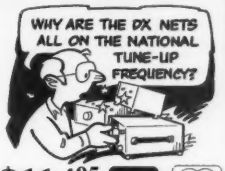

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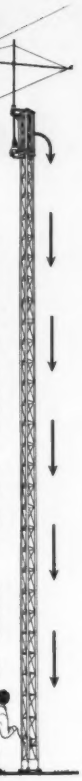

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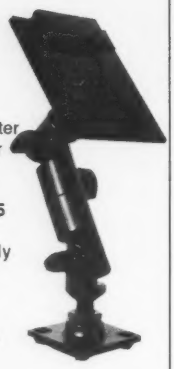

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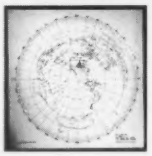

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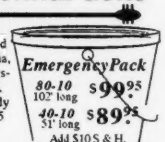

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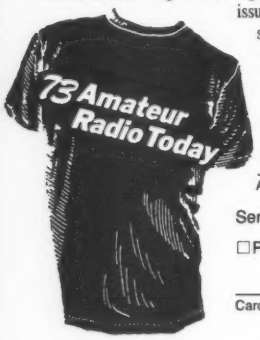

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9 Review: Yaesu FT-990
10 The QUAG-V
11 Computerized Tuning for Ramsey Receiver Kits
12 Review: ICOM IC-2SRA
13 Not Just Another Island
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73 Review *by Rick Littlefield K1BQT*

The Ramsey 2 Meter Transceiver Kit

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Ramsey Electronics
793 Canning Parkway
Victor NY 14564
(718) 924–4560
Price Class: FTR-146, $150;
FTR-C (cabinet), $25; add
$10 S&H, plus $4.50 for COD.

When Ramsey Electronics first advertised the FTR-146 2 meter transceiver kit, the promise of a synthesized VHF radio for $149 was just too attractive to pass up. My only fear was that a project this inexpensive might be difficult to construct—or not work very well. Fortunately, these fears proved unfounded.

Features

The FTR-146 is a six-channel diode-programmable PLL-synthesized FM transceiver, covering 144.000 to 147.995 MHz. "Diode-programmable synthesis" means that you select six of your favorite operating frequencies and program them into the radio when you build it. Programming is done by installing diodes in a binary matrix, a procedure that is much easier than it sounds. Transmit offsets for +600 kHz, −600 kHz, and simplex are also programmed in by installing diodes. Ramsey conveniently provides a 12-position switch with the kit, so you can add up to six additional channels by expanding upon their diode matrix.

FTR-146 RF output is rated at 4–6 watts, which is plenty of signal for base or close-in mobile operation. Since the radio draws only 1.5 amps on transmit, nearly any inexpensive CB-type supply will provide enough power.

Although amenities like a signal strength meter, microphone, and built-in speaker aren't provided with the FTR-146 kit, it does include attractive "packet-ready" features other radios may not have—like PIN-diode T/R switching and a DIN-type TNC jack on the rear panel. An onboard jumper selects squelched speaker-level audio or unsquelched discriminator-level audio for your TNC. For an additional $24.95, Ramsey offers an attractive 9″ x 6″ x 1.5″ cabinet with silk-screened front and rear panels, and matching knobs. I found plenty of room inside this enclosure to install a homebrew channel expansion board and a 3″ speaker.

Constructing the Kit

With any kit, the dividing line between success and frustration usually depends on two key factors: the integrity of the circuit board, and the clarity of the instructions. A poorly designed board or a confusing manual can turn even the simplest kit into a nightmare Happily, I found the FTR-146's CAD-designed two-sided PC board an absolute pleasure to construct. Part locations are silk-screened on the component side, and there's plenty of space for everything to fit. You won't need the dexterity of a brain surgeon to make it look professional. The same CAD program that generated the board layout was used to produce striking 11″ x 17″ multi-colored parts placement and schematic diagrams for the manual. Credit goes to project designer Tom Hodge WA2YTM for some fine computer work.

In a similar vein, I found the kit's documentation, written by Dan Onley K4ZRA, to be equally impressive. The manual has over 100 pages of information and diagrams to guide you through construction, complete with check-listed steps, mini-schematics, and parts placement figures for every stage. Even the parts list is cross-referenced to the installation steps in the manual! The instructions are not only detailed, they're educational as well. By the time I completed the project I had learned a great deal about how synthesized transceivers work.

For the most part, you won't need special tools to complete this project. However, if you make a mistake, you may need a vacuum-type desoldering tool (or a roll of Solderwick™) to remove parts from the radio's double-sided, plated-through, PC board. Radio Shack's desoldering iron (#64-2060) is inexpensive at $8.49, and does this job well. Also, tune-up requires nonmetallic tuning wands, including one with an insulated metal tip like the GC-8608 (Radio Shack Tuning Wand Set #64-2230). Finally, some of the air-wound inductors are formed on a 3/8-inch 18-TPI bolt. If you don't have one on hand, this could mean an unscheduled trip to the hardware store.

Improvements

I really enjoyed building the radio. But, before I'm accused of working for Ramsey's ad department, I'll confess to at least ONE aspect of the kit that I don't like. The solid-copper bell wire supplied for point-to-point wiring of controls and switches was hard to handle—and easy to break. I threw it away and made a color-coded harness from flexible stranded wire.

More significantly, I had to solve a couple of technical snags to get my rig on the air. Initially, the radio's squelch circuit wouldn't function properly, due to a defective IC. Ramsey helped me find the problem and promptly mailed a new chip.

Photo A. Completed FTR-146, front panel.

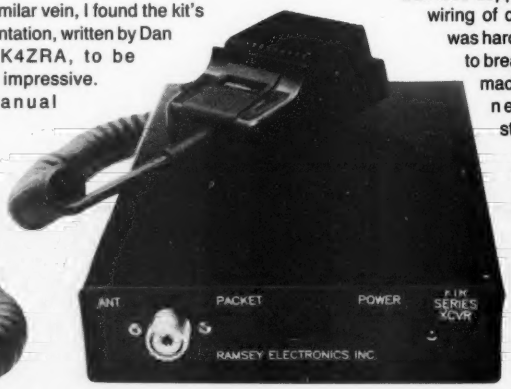

Photo B. Completed FTR-146, rear panel.

Photo C. The kit comes with a high-quality PC board, all components and excellent documentation.

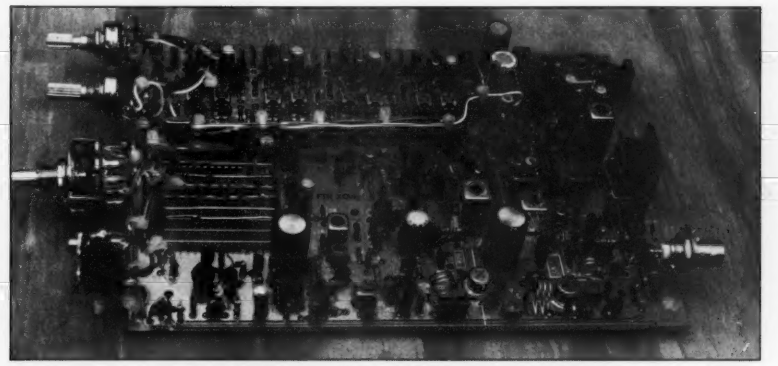

Photo D. The assembled FTR-146 transceiver board.

The second snag was a bit more complex. The radio's synthesizer IC tunes in 10 kHz steps. When a +5 kHz frequency change is needed for 15 kHz channel spacing, the loading on each mixer oscillator crystal is switched by diodes to "pull" that oscillator in frequency (recall the +5 kHz switch on your old synthesized HT). Unfortunately, I couldn't make two of the four oscillators in my radio pull far enough to hit both frequencies. I traced the problem to out-of-tolerance crystals. Once again, Ramsey helped me diagnose the problem, and promptly shipped the items I needed.

Getting on the Air

Aside from the crystal problem, alignment was straightforward. You'll need a frequency counter to set each oscillator on frequency, and an RF power meter to peak the transmitter. You'll also need a weak signal source to align the receiver. Lacking an expensive FM service generator, I terminated the antenna jack with a 47 ohm resistor and used a short scrap of wire to pick up a local repeater. Any signal weak enough to produce audible background noise will suffice.

During construction, you'll wind many of the radio's air-wound inductors by hand—a somewhat imprecise science. During tune-up, you may need to "tweak" some of these by compressing or stretching the windings (tweaking may be needed to bring a coil's associated trimmer capacitor in-range, or to optimize a circuit using a fixed capacitor). Once aligned, my radio delivered 4.5 watts into a 50 ohm load and approximated the receiver sensitivity of my ICOM HT. I later measured receiver sensitivity at a respectable 0.4 µV on an FM service monitor.

The FTR-146 microphone circuit was designed to work with an ICOM-type speaker mike, and employs "load-sensing" to activate the transmitter (there's no separate PTT line). If you opt to use a replacement-type mobile mike, you'll need to wire the PTT switch in series with the mike cartridge in order to key the radio. When I first tested my microphone, I got reports of a loud hum on the audio. I quickly discovered the cause to be stray RF pickup—a consequence of running the rig without a case into a rubber duck antenna. Connecting an external antenna cured the hum.

There are as many ways to package the FTR-146 as there are ways to use it. I keep mine next to our telephone, serving as base station for our "multi-ham" household. For this task, I installed a three-inch speaker in the Ramsey cabinet. This provides plenty of volume to hear calls while you're in another part of the house. More extensive customizing is possible—including sophisticated channel switching schemes, and even a digital display. Toward this end, manual writer Dan Onley has established a user's group and newsletter for FTR builders in order to share customizing schemes and circuit upgrades.

The Bottom Line

The Ramsey FTR-146 kit is a fine value from several standpoints. First, it's instructional. After building it I find synthesized radios less mysterious, and I'm more confident when tackling repairs on other radios.

Second, the FTR-146 is the right tool for the job. I don't really *NEED* a 50-watt radio with 100-channel scanning to hit the local repeater. The FTR-146 does this flawlessly, and people say that the Ramsey transmitter audio sounds superior to my other rigs!

Finally, for the serious packeteer, the FTR-146 may be a sensible radio to dedicate to online data communication. Hook it onto your TNC or modem and save your other rig for voice contacts.

Evolution

By the time you read this review, an enhanced version of the FTR-146 (the FX-146) will be available for $169. According to Ramsey designer Tom Hodge, this FM transceiver is now on the bench and headed for production soon. This new radio uses a more sophisticated synthesizer chip which expands receiver coverage to 20 MHz, provides a programmable offset, and facilitates producing 220 and 440 MHz versions of the radio. The new synthesizer also provides 5 kHz steps, eliminating the need to shift mixer frequencies. Other changes include a simplified receiver circuit using a more advanced IC. According to Hodge, receiver changes will provide tighter IF filtering, improved image rejection, an RSSI meter output, and enough extra board space to include a 12-channel diode matrix.

OK, so you are nervous around hot soldering irons and you have fat fingers. Should you tackle one of these kits? I say YES! Through the FTR-146, Ramsey Electronics has clearly demonstrated the ability to engineer and produce a good radio that's easy to build. And, they've shown that they can support it with first-class documentation. If my experience with the FTR-146 is any indicator, construction of the FX-146 kit should be a snap as well! I like my radio a lot, and I suspect that Ramsey transceivers are going to be with us for a long time to come. 73

Contact Rick Littlefield K1BQT at 109A McDaniel Shore Drive, Barrington NH 03825.

73 Review

by Dick Goodman WA3USG

The BayCom Packet System

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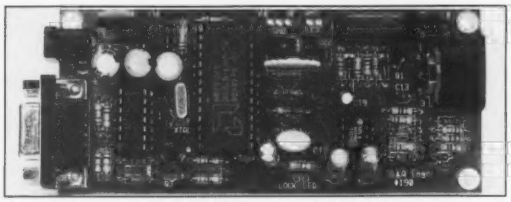
Over the course of the last seven years packet radio has developed into amateur radio's fastest growing mode. The computer hackers love it, some operators find it useful for obtaining the latest information on a variety of subjects from ham radio to amateur astronomy, and other operators find that packet is not their "cup of tea." One thing stands incontestable, however: Packet has become prevalent in virtually all aspects of our hobby. Visit any reasonably large city, tune around 144.91–145.09 MHz, and the sound of various packet networks will greet you. Tune the HF bands near the domain of what used to be our primary digital mode (RTTY), and again the sound of 300 baud packet bursts will be heard. Virtually all of the new amateur satellites use packet as the communications medium. Most importantly, packet has given the amateur community visibility and recognition by advancing the state of the art in digital communications.



The A & A Engineering modem for the BayCom packet program.

One of the main reasons for packet radio's skyrocketing popularity is its ease of implementation. Only a few years ago getting on packet meant building a terminal node controller (TNC) from a kit and interfacing it to one of the many then nonstandard computers. To those with computer expertise, this was a challenge that was eagerly anticipated. To others with a curiosity about this new mode, but who were somewhat less endowed with "computer smarts," this challenge turned into a fiasco.

Differences in standards, such as TTL vs. RS-232, resulted in damaged equipment and hurt pride. Luckily, the manufacturers of packet systems took note. Soon, factory-built TNCs were on the market with documentation that made computer and radio interfacing less of an arduous task. Each year, as the state of the art progressed, the TNCs became more capable. As of this writing, most TNCs are effectively multimode controllers that offer a diverse mix of digital modes from packet to SSTV in a single turnkey package. "Plug and play" has become the watchword.

With the present simplicity of packet radio, I found it puzzling that it wasn't being used in portable applications or public service more frequently. In October of 1989 I put together a portable packet system. It consisted of an old 2 meter handie talkie, a standard packet TNC, a Tandy LT-1400 laptop computer, and all necessary cabling. I packed all this into my attache case and headed into the wilderness for my first QRP, portable packet operation (actually the "wilderness" was a hotel room on a business trip).

Upon arrival, I set everything up and found some problems. Packet requires virtually full quieting signals with no interference. The HT with its rubber ducky antenna had to be moved a considerable distance from the TNC to avoid RFI. Even using an external antenna, I couldn't move it far enough from the TNC in the confines of the hotel room to eliminate all RFI. RF from the HT would also get into the TNC, sometimes causing it to lock up. Finally, it seemed that interconnecting the TNC to the computer really enhanced the RFI problems. I used shielded cable, ferrite forms, and all the suggested solutions, to no avail. It seemed that portable packet required a "fixed" antenna located at least 30 feet from the TNC and computer.

Get Rid of the TNC!

Commodore 64 users have a system of "TNC-less" packet, known as DigiCom›64, which has been in existence for several years.

The function of the TNC has been implemented in the Commodore's software. Even through this eliminates the TNC from the RFI equation, another problem is presented. The Commodore 64 and its separate disk drive was originally designed for 120 VAC operation. It can be modified for 12 VDC operation and through use of A & A's DigiCart›64 cartridge the disk drive can be eliminated. However, the "64" still requires an external monitor, generally a TV set. Operators have used this system successfully in portable packet radio, but if there was a way to do the same thing with the IBM-compatible laptop then portable operation is a whole lot easier.

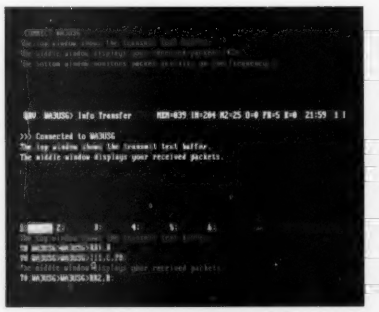
Enter the BayCom TNC-Less Packet System!

Florian Radher DL8MBT and Johannes Kneip DG3RBU of Regensburg, Munich, Germany have developed a program to allow most IBM compatibles to run packet radio without a TNC. Their system really consists of two parts: a shareware program called "BayCom," and a simple modem. The program is available from several sources, including A & A Engineering and many telephone BBS systems, such as CompuServe. Although you can completely home-brew a modem, a new kit which includes HF packet is available from A & A Engineering.

The A & A Engineering Modem

The A & A modem uses the 7910 "World Modem Chip," and is quite easy to build. It came with a high-quality printed circuit board and all the components, and took a total of just two hours to build. It is quite small (approximately 1.5" x 2.5"). Connectors are supplied to interface with the computer (DB9) and the radio (5-pin DIN).

Another nice feature is movable jumpers that allow the push-to-talk (PTT) configuration to be switched from the standard "grounded pin" to various "handie talkie" systems. By simply moving two jumpers and changing a cable, either conventional FM radios or HTs may be used. The PTT function is performed via a relay on the modem board.



The terminal screen for the BayCom packet program. Three window area display transmitted packets, received packets and monitored packets.

The only adjustment on the modem is the transmit audio level. The modem draws about 100 mA from a 12 VDC input. A & A includes a small 12 VDC wall type plug-in power supply with the modem. I found that the 5-volt regulator (7805) ran quite warm. I added a small heat sink on the regulator to keep it cooler.

The only other control on the modem is a switch that selects normal VHF operation, enhanced VHF operation, or HF packet operation. On VHF FM I noticed no difference between the "normal" or "enhanced" mode—both worked quite well. It should be noted that the modem effectively has an "audio" DCD.

Whenever the squelch is broken (by noise as well as by bona fide packets) the DCD light comes on. This causes no problem on FM packet, but on HF SSB noise and static crashes will generate a false DCD. A very nice feature of this modem is its capability to function on HF packet. It's helpful to use an external tuning indicator on HF since the DCD LED on the modem is responsive to any audio. I paralleled the BayCom modem with my AEA PM-1 packet modem (which has a tuning indicator). HF operation with the BayCom system is possible, but any noise or QRM on the frequency degrades its performance. This problem is typical with every HF packet system, however. Finally the A & A modem incorporates a 45 second 'watchdog timer' to prevent QRMing the frequency if there is a malfunction or problem with the computer or modem.

The Program (BayCom Version 1.2)

The Terminal/TNC emulation program is superb! There is a configuration file called "BAYCOM.INI" that must be initialized with your parameters (e.g.: COM port number, callsign, CTEXT, TXD, etc). Most parameters will be instantly recognizable to those with experience in conventional TNCs. Screen colors and screen layout may be modified. Up to nine simultaneous connect channels are supported.

Once the configuration file is set up and the program is booted, the terminal screen will be displayed. This screen consists of three sections: a transmit window, a receive window, and a monitor window. The transmit (or top) window holds data from the keyboard or the file that is to be sent. The receive (or center) window displays data from the station that you are connected to. The monitor (or lower) window displays both transmit and received data, along with the status of the packet, or any system requests (e.g.: connect request) as well as all packet activity on the frequency. The size of each of these windows may be changed to make that window the predominant one. By using the appropriate function key, the cursor may be placed in any window and the window contents scrolled back a number of lines (scroll back buffer size specified in BAYCOM.INI).

Since the computer is essentially the TNC, many parameters not available with conventional packet systems are displayed. The upper window status line contains the operational mode, callsign with SSID, present port state (disconnected, info transfer, frame reject, waiting acknowledge, reject sent).

Another very useful parameter that is displayed is the number of outstanding unacknowledged packets, along with the maximum number allowed. This is valuable information to have on a busy channel. Once the number of outstanding packets reaches the maximum allowed, an automatic disconnect will take place. Monitoring these parameters will flag you to stop generating additional packets until some of the outstanding ones are acknowledged.

Other displayed parameters are memory buffer sizes, Frack time, channel number, connected callsign, time from your system clock, and Com port number.

There is an excellent help screen available via one keystroke. The program has a self-connect mode that can be used without a modem. Issuing a connect request to your own callsign will cause BayCom to connect to yourself. Many aspects of the program may then be tested, exercised, and practiced. Going back and forth between the program and the help screen will help you become an "experienced user" in a matter of an hour or so.

BayCom has the capability to transfer both ASCII and binary files (binary to other BayCom systems). It offers extensive file handling utilities in the form of its diverse command set. Files may be created and edited offline without leaving the BayCom program. Most TNC monitoring functions are supported (e.g. Monitor Heard), as well as functions such as digipeating. Even the connect and disconnect sequences are enhanced with "spiffy" sound effects. For a pure packet terminal program, this is the best that I have ever seen. . . and you don't need a TNC! On an even more positive note, I could detect NO RFI FROM THIS SYSTEM in my radio!

Suggested Improvements

The only real problem that I could find was with the documentation. This consists of an ASCII file on the BayCom system disk. Simply copied to the printer, it generates a complete 49-page users' manual with a table of contents and index. While it contains a wealth of information, its translation from German is, at times, confusing.

Some of the result and error messages generated by BayCom are in German, although these will be changed to English in the near future. While this causes no problems, it is a bit startling. Finally, the modem section in the users' manual is apparently written for a different modem than the one provided in kit form by A & A Engineering. However, if you do purchase the A & A kit, it is "plug and play." The documentation provided by A & A is quite good and it identifies all necessary pin-outs to get both the computer and radio interfaced correctly.

In Summary

BayCom is an absolutely superb system! It is simple to learn and use. It is second to none for portable operations, and should be quite useful in public service and emergency communications. 73

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Project Inspire: A VLF Space Shuttle Experiment

Build a simple receiver to explore the wonders of the 60,000 meter band!

by Jim Ericson KG6EK

Tired of hearing the same old stuff on your radio? Do you tend to think of 160 meters as the "bottom of the band"? This article will discuss both man-made and natural radio activity between 100 Hz and 10 kHz, the absolute bottom end of the VLF (Very Low Frequency) spectrum. If we call 5 kHz the center of the band, we're talking about a 60,000 meter wavelength! I will describe a simple and inexpensive (under $40) VLF receiver design, and present some ideas on how you can participate with space scientists in scientific data gathering involving VLF propagation (and possibly share some of your ham radio expertise with U.S. high school students and other experimenters) during a March 1992 space shuttle experiment. Letters inviting participation in the listening experiment have already gone out to 10,000 high school physics classes in the U.S., and both amateurs and private experimenters are also being invited to participate.

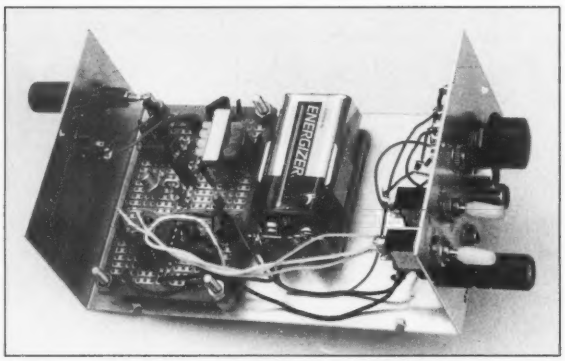

Photo A. The RS-4 VLF receiver layout, using perfboard construction technique. (Photo by Mike Mideke WB6EER.)

A Quick History

The story begins in World War I Europe, where both sides used telephones for trench communications. Soon the vacuum tube came along, opening the way for high gain amplification. Each side began intercepting "leakage" from the other's telephone communications by using amplifiers connected to widely separated ground rods. Electronic Counter Measures were born! Evidently this system worked quite well most of the time, but now and then strange falling notes filled the monitors' headsets, sounding like phantom shells passing overhead.

German scientist H. Barkhausen was assigned to fix this interference problem. He was unsuccessful, but he became intrigued by the mystery. He and other researchers picked at it for years, and by the late 1920s there was general agreement that lightning was responsible for these "whistlers." But it was not until the 1950s that the exact mechanism was found.

As researchers learned, lightning is an enormous spark discharge which produces a broad spectrum of radio energy in which all frequencies appear at once, from hundreds of hertz through hundreds of MHz. However, scientists discovered that a large percentage of lightning's effective radio energy is concentrated in the 1 to 20 kHz region, loosely defined as VLF.

VLF Punches Through the Ionosphere!

VLF static bursts caused by lightning propagate with great efficiency in the waveguide formed by the earth's surface and the lower regions of the ionosphere. Mostly it sounds just like the static you hear on an AM radio receiver. But if you listen closely, you'll sometimes find that somewhere below 10 kHz the static crackles become liquid "pings" or "whistles"...brief musical notes.

Today, the mechanism for this effect is well understood. Radio signals propagating through a non-vacuum medium become dispersed. This means that the higher frequencies travel a little faster than the lower frequencies. A lightning burst starts out as all frequencies at once and propagation in the earth-ionosphere waveguide effectively spreads the frequency components to produce audible "pings" at the lowest frequencies. By measuring this dispersion, investigators can calculate just how far the signals have traveled.

Early investigators were puzzled by the fact that nobody could find signal paths on earth that were anywhere near long enough to account for the huge amount of dispersion heard in long whistles. Eventually, new techniques including spectrum analysis helped to unravel the mysteries of whistlers. L.R.O. Storey of Cambridge University and R.A. Helliwell of Stanford University were among the widespread group which developed a new view of the earth's near-space environment, opening up the field of magnetospheric physics. As it turned out, the long dispersive whistler paths were ducts in the magnetospheric plasma which extend between the Northern and the Southern Hemispheres. These ducts (sort of like the lines you see when you sprinkle iron fillings over a bar magnet) arch to a maximum distance of several earth radii, far beyond the boundaries of our ionosphere. This explains why some whistlers have a duration of several seconds when heard here on earth.

The Antarctic Antenna Farm

In the 1950s, researchers discovered that CW transmissions from military VLF stations sometimes triggered whistler-like events. In the 1960s, they chose Antarctica as a perfect spot for controlled whistler research. Plenty of room to put up a 40 kilometer (26 mile) VLF dipole transmitting antenna, mile-thick ice (a nice insulator to keep the antenna off the "ground," and almost no interference from AC power!

A powerful transmitter was built at Siple Station, Antarctica. In the 1970s and '80s, transmissions from Siple generated a variety

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CT-90	10 Hz–600 MHz	< 10 mV to 150 MHz < 150 mV to 600 MHz	9	0.1 Hz, 10 Hz, 100 Hz	$169.95
CT-125	10 Hz–1.25 GHz	< 25mV to 50 MHz < 15 mV to 500 MHz < 100 mV to 1 GHz	9	0.1 Hz, 1 Hz, 10 Hz	$189.95
CT-250	10 Hz–2.5 GHz typically 3.0 GHz	< 25 mV to 50 MHz < 10 mV to 1 GHz < 50 mV to 2.5 GHz	9	0.1 Hz, 1 Hz, 10 Hz	$239.95
PS10B Prescaler	10 MHz–1.5 GHz, divide by 1000	< 50 mV	Convert your existing counter to 1.5 GHz		$89.95

SPEED RADAR $89.95 complete kit SG-7

New low-cost microwave Doppler radar kit "clocks" cars, planes, boats, horses, bikes or any large moving object. Operates at 2.6 GHz with up to 1/4 mile range. LED digital readout displays speed in miles per hour, kilometers per hour or feet per second! Earphone output allows for listening to actual doppler shift. Uses two 1-lb coffee cans for antenna (not included) and runs on 12 VDC. Easy to build—all microwave circuitry is PC stripline. Kit includes delivery. ABS plastic case with speedy graphics for a professional look. A very useful and full-of-fun kit.

BROADBAND PREAMP

Boost those weak signals to your scanner, TV, shortwave radio or frequency counter. Flat 25 dB gain, 1 to 1000 MHz. 3 dB NF. BNC connectors. Runs on 12 VDC or 110 VAC.

PR-2, wired, includes AC adapter $59.95

2M POWER AMP

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PA-1, 40W pwr amp kit $29.95
TR-1, RF sensed T-R relay kit . $ 8.95

FM WIRELESS MIKE KITS

FM-3 SHOWN

Pick the unit that's right for you. All units transmit stable signal in 88–108 MHz FM band up to 300' except for hi power FM-4 that goes up to ½ mile.

FM-1, basic unit ..... $ 5.95
FM-2, as above but with added mike preamp ..... $ 7.95
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FM-3, complete unit includes case, battery, switch, antenna, and built-in condensor mike. Excellent fidelity, very small, kit $16.95
FM-3WT, as above, but fully wired and tested $19.95
SMC, miniature sensitive mike cartridge for FM-1, 2, 4 ..... $ 2.95

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A real microwave Doppler sensor that will detect a human as far as 10 feet away. Operates on 1.3 GHz, and is not affected by heat, light, or vibrations. Drives up to 100 mA output, normally open or closed, runs on 12 VDC.

Complete kit MD-3 . $16.95

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Neat kit that will produce 25 different classical and popular tunes, plus 3 doorchime sounds. Lots of fun for doorbells, shop, or store entrances, car horn, music boxes, etc. Runs on 9V battery or wall transformer. Excellent speaker volume and adjustable tempo and pitch. Add our case set for a handsome finished look.

Complete kit, MM-5 ..... $24.95
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PACKET RADIO

Commodore C64/128 packet radio interface. Uses famous German Digicom software. Features EXAR IC chip set for reliable operation—runs HF or VHF tones. Includes FREE disk software. PC board, all necessary parts and full documentation.

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VOICE ACTIVATED SWITCH

Voice activated switch kit provides switched output with current capability up to 100 mA. Can drive relays, lights, LED, or even a tape recorder motor. Runs on 9 VDC.

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TELEPHONE TRANSMITTER

Mini-sized with professional performance. Self-powered from phone line, transmits in FM broadcast band up to ¼ mile. Installs easily anywhere on phone line or inside phone!

PB-1 kit $14.95

NEW

SPEAKER PHONE

Talk on the phone hands-free, great to put in shop or shack, press the button to answer—no actual phone needed. Works same as commercial units. Talk from anywhere in room, phone line powered—no battery needed. Super for family and conference calls or buy two for hands-free intercom! Add our case set for a pro look.

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AA-7 Kit $24.95
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SS-7 kit $29.95
Matching case & knob set, CSS $12.95

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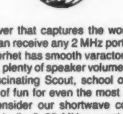

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of magnetospheric signals which were recorded by a monitoring station at the magnetic conjugate region near Roberval, Quebec, and by a variety of satellite monitors. These experiments have advanced scientists' understanding of the ionosphere and magnetosphere while suggesting many subjects for further research.

The Need for More Ears

Until recently, VLF research was carried out using only a handful of listening stations manned by the government and a few universities. In 1989, high school and amateur listening participation was invited in a joint NASA/Soviet experiment involving the Soviet satellite *ACTIVE*. The Soviet satellite attempted artificial stimulation of the magnetosphere by passing large 10.5 kHz currents through a 20-meter-diameter loop antenna. Unfortunately, the loop apparently deployed in a twisted configuration, and the SWR was very high. Several months of monitoring by NASA, Soviet observers, and dozens of private experimenters in the U.S. failed to produce any copy. These joint experiments were nonetheless successful in that they provided the first occasion for participation by amateurs and high school groups. The possibilities of a large network of coordinated monitors had never before been explored.

INSPIRE 1992

INSPIRE stands for Interactive NASA Space Physics Ionosphere Experiments. The private industry sponsors who, at this time, are coordinating with NASA include TRW Systems and Micro Power Systems in California, and MESA Art and Printing in Arizona. In March 1992, NASA plans to launch the space shuttle (STS-45) with the first mission in a series of 10 flights called ATLAS (ATmospheric Laboratory for Applications and Science). *[Ed. Note: STS-45 will also be the next SAREX flight.]* One of the ATLAS investigations is called SEPAC (Space Experiments with Particle ACcelerators), which is an experiment involving the earth's atmosphere, ionosphere, and magnetosphere. The 7 kW SEPAC accelerator (see Photo A) will emit a beam of electrons modulated by a series of audio tones from 50 Hz to 7 kHz. A unique feature of the transmitter is that it does not directly utilize a metallic antenna. The modulated electron beam projected into space will become its own "virtual" antenna!

SEPAC will use coordinated high school and amateur experimenter teams to listen and tape record the radio waves. The locations where the transmissions can be detected will define the "footprint" of the signal, an impossible task without a large number of participants.

How to Hear Audio Frequency "Radio" Waves

Radio signals in the VLF region occur at frequencies ranging from a few hundred hertz to something above 10 kHz. These frequencies are readily accessible to human hearing but, even so, they are not directly audible. Why? Because they are electromagnetic events which do not produce the mechanical vibrations in the air that our ears need to detect them as sound.

In order to hear these waves, we must convert their electromagnetic activity to acoustical vibration. Conversion is done with a transducer—a simple amplifier connected to a loudspeaker or headphones—that uses the electrical energy to move air molecules to produce an audible sound.

Building a Practical VLF Receiver

It is fortunate that very simple and inexpensive circuits can be used to hear and record both natural and man-made VLF signals. Beginners can build them; it is not necessary to understand the theory of operation in order to make equipment that works very well.

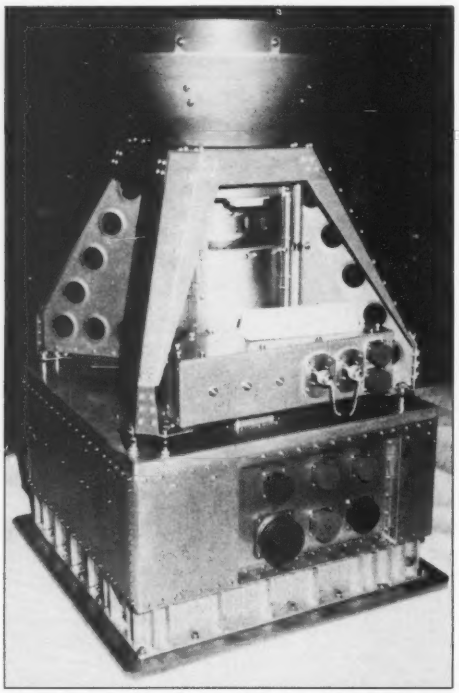

Photo B. The "business end" of the SEPAC Electron Beam Generator. The 7.5 kW electron beam is emitted from the cone at the top. The base (measuring about two feet on a side) is a large heat sink. Peripheral drivers and associated electronics are in a separate module. This experimental package will be mounted on a pallet in the cargo bay of the shuttle. (Photo courtesy of TRW.)

The receiver described here has been dubbed the RS-4 by its designer, amateur experimenter Michael Mideke WB6EER. The identical design (in kit form) will be constructed and used by the participating high school physics classes. All essential components are listed in the current Radio Shack catalog.

The receiver uses a FET input stage to transform the extremely high impedance of a short (1 to 10 foot) antenna to a more practical value. A low-pass filter rolls off frequencies above 7 kHz in order to prevent overloading from high power OMEGA radio-navigational signals at 10.2 kHz and above. The active high-pass filter (controlled by SW-1) significantly rolls off frequencies below 1 kHz, helping to reduce the hum from 60 Hz power line harmonics. A ferrite bead (Amidon FB901-43, available from Amidon Associates, 12033 Otsego Street, North Hollywood CA 91607) in the FET gate circuit helps prevent overloading by radar and TV. Resistor R1 should be shorted via SW-3 when using an antenna longer than about 30 feet. A switch and jack are included to allow the operator to use a microphone for insertion of time marks and commentary while recording.

Note that the receiver uses a jack instead of a conventional power switch. Inserting a shorted plug into the power jack completes the battery negative circuit, applying power to the unit. This approach prevents accidental turn-on of the receiver while it is being transported. (There is nothing more frustrating than pulling the receiver out of your knapsack to discover that it has gotten turned on and the battery is dead!) *[Ed. Note: You can use an SPST switch in place of the jack if you so desire.]*

The layout of the circuit board is not particularly critical (see the accompanying photo for suggested layout using perfboard construction). Try to keep "output stuff" as far as possible from the antenna input. Component values aren't critical either, but try to keep the 11k and 22k resistors associated with U1-A within 5% or so. Since Radio Shack doesn't supply 11k resistors, you can parallel two 22k units, or series-connect a 10k with a 1k.

When all components (including jacks and switches) are soldered in place, it is a good idea to double-check the wiring and do some preliminary tests before mounting the board in the enclosure. The first check is to remove U1 and connect the 9V battery to the circuit, in series with a milliammeter. It should read about 0.5 mA. If the meter indicates much more, or no current at all, something is wrong. Go back and check your work.

The second test is to disconnect the power and insert U-1 in its socket (check for proper orientation). When you reconnect the battery, current consumption should be 3 to 6 mA. If it is, chances are good that everything is OK.

When the receiver is completed, raise the whip antenna a few inches and attach a ground (or several feet of wire if no ground is handy). Listen with Walkman-type headphones or a monitor amplifier, and verify that you have hum and noise. Touching the small antenna, or even moving your hand near it should increase the hum intensity. Switching the high-pass filter in and out should make a noticeable change in the sound of the output. The series antenna resistor will make little difference, whether it's in or out.

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Using the Receiver

Even though high-pass filtering is incorporated in the receiver design, it is not a cure-all for the pervasive hum radiated by the AC power lines that dominate our modern civilization. To get reasonable reception of VLF signals, you're going to need to find a site which is at least 500 meters from AC power lines. You'll also need some kind of ground or counterpoise. Usually a simple one-foot nail or spike provides enough grounding to prevent squeals in the receiver. The chassis of an automobile (engine off!) also works nicely. Try the little Radio Shack whip antenna if you are in the open, and maybe a 20- to 50-foot wire if you're in the woods. You will hear some AC line hum, but if you've picked the right site you'll also hear clicks, pops and, with some patience, some whistlers!

Alternatives to Building RS-4 from Scratch

The volunteer nonprofit INSPIRE organization is offering the RS-4 receiver in kit form to the high schools, and the same deal is available to radio amateurs and private experimenters. At $49.95 postpaid (plus $4.12 sales tax in CA), the kit includes:

- All components, enclosure, etched PC board, and detailed assembly instructions.
- *The Beginner's Guide to Whistler Hunting*, by Michael Mideke WB6EER, a 23-page history of VLF, including tips and advice on observing, describing, and recording natural and man-made signals at very low frequencies.
- A 60-minute narrated cassette tape by Mideke which samples the incredible variety of sounds that can be heard in the VLF range. Included are notes describing the audio segments, and sample spectograms of some of the signals.
- Instructional materials designed to assist you in working with high school students to mutually learn more about natural radio and the ATLAS-SEPAC INSPIRE mission.
- You will also receive updates by mail about SEPAC operation schedules, and the status of the mission.

To order an INSPIRE kit, send a check made out to INSPIRE to: Bill Pine, Science Department, Chaffey High School, 1245 N. Euclid Avenue, Ontario CA 91762. If you need a receipt, or have any questions, please include an SASE. If you just want the blank PC board, it's available for $7.

If you decide to build the RS-4 as described in this article, but don't anticipate direct project participation, you may still want to get a copy of the Mideke booklet and audio tape. The Guide is $6 postpaid in the U.S. (plus 83¢ sales tax in CA), $12.50 outside North America. Write Michael Mideke at P.O. Box 123, San Simeon CA 93452-0123.

For those not interested in construction but who would like to experiment with a receiver, Conversion Research has a new VLF pocket receiver available completely assembled for $48 postpaid in the U.S. (plus $3.96 sales tax in CA). The circuit is not exactly the same as the RS-4, but it is fully effective, includes a 33-inch telescoping whip antenna and a battery, and is housed in a sturdy diecast aluminum enclosure with an on/off

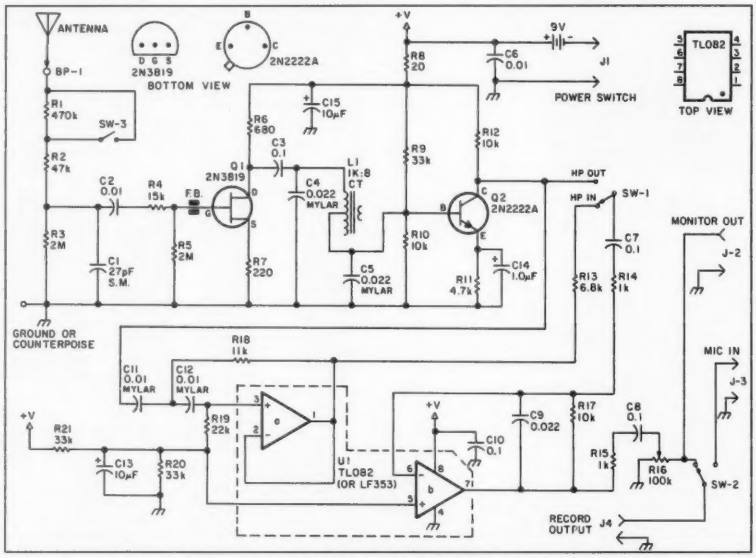

Figure 1. Schematic for the RS4 VLF receiver.

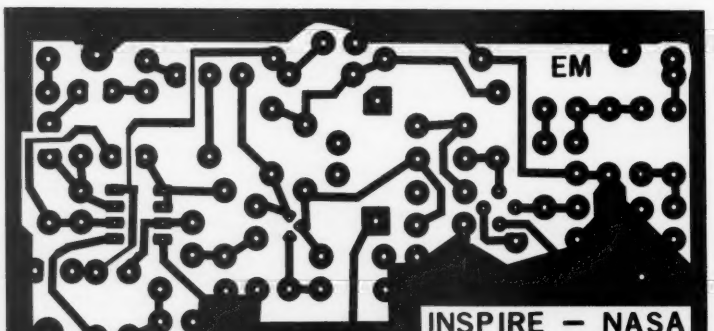

Figure 2. PC board foil pattern for the receiver.

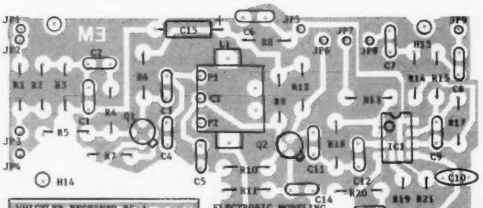

Figure 3. Parts placement diagram.

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PC66A-B Uniden 40 channel CB Mobile $78.95
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PRO520XL-B Uniden 40 channel CB Mobile $54.95
PRO535E-B Uniden 40 channel CB Mobile $69.95
PRO538W-B Uniden 40 ch. weather CB Mobile $78.95
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CARD-B 2 band credit card size radar detector $89.95
RD3XL-B Uniden 3 band radar detector $109.95
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RD27-B Uniden visor mount radar detector $39.95

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19LTD-B Cobra Classic series CB radio $44.95
21LTD-B Cobra Classic series CB radio $54.95
25LTD-B Cobra Classic series CB radio $89.95
29LTD-B Cobra Classic series CB radio $109.95
146GTL-B Cobra AM/SSB CB radio $129.95
148GTL-B Cobra AM/SSB CB radio $149.95
90LTD-B Cobra Base station $89.95
142GTL-B Cobra AM/SSB Base station $199.95
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Bearcat 200XLT-B

List price $509.95/CE price $239.95/SPECIAL

12 Band, 200 Channel, Handheld, Search, Limit, Hold, Priority, Lockout

Frequency range: 29-54, 118-174, 406-512, 806-956 MHz.

Excludes 823.9875-849.0125 and 868.9875-894.0125 MHz.

The Bearcat 200XLT sets a new standard for handheld scanners in performance and dependability. This full featured unit has 200 programmable channels with 10 scanning banks and 12 band coverage. If you want a very similar model without the 800 MHz. band and 100 channels, order the BC100XLT-B for only $179.95. Includes antenna, carrying case belt loop, ni-cad battery pack, AC adapter and earphone. Order your scanner from CEI today.

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List price $549.95/CE price $239.95/SPECIAL

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CE price $48,880.00/Special order - allow 45 days for delivery. When war broke out in Iraq, you heard all the action because CNN had a satellite telephone. When a disaster such as an earthquake or a hurricane strikes your community and communications are disrupted, you can depend on instant reliable communications, just like CNN did using your Magnavox MagnaPhone. Inmarsat communication satellites are in geostationary orbit along the equator. They beam two-way voice and data transmissions between your satellite phone and fixed earth stations. In most instances, telephone calls are dialed directly once you have selected the satellite serving your location. No matter where you are on the planet, the MagnaPhone automatically selects the Land Earth Station (LES) nearest the destination called. This makes placing a call as easy as using a standard telephone. Dual ID numbers permit a separate Inmarsat telephone number to be used to route calls to one of the external telephone ports which could be used for a fax machine or a computer data line. For telephone, telex, fax and data communications anywhere in the world, the new MX2020P MagnaPhone is the most compact Inmarsat-A, Class 1 terminal available today. Like a cellular phone, airtime will be billed to your account. The new MagnaPhone weighs just 47 lbs (21 kg), including the antenna. Add the optional ruggedized case (only $950.00) and it can travel as airline baggage on commercial carriers. When you arrive at your destination, installation can be done in less than five minutes. For more information call our Emergency Operations Center at 313-996-8888.

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BP70-B Ni-Cad battery pack for BC70XLT scanner .. $39.95
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BC147XLT-B Bearcat 16 channel 10 band scanner .. $94.95
BC172XL-B Bearcat 20 channel 11 band scanner .. $124.95
BC177XLT-B Bearcat 16 channel 11 band scanner $129.95
BC590XLT-B Bearcat 100 channel 11 band scanner $194.95
BC760XLT-B Bearcat 100 channel 12 band scanner $254.95
BC002-B CTCSS tone board for BC590/760XLT $54.95
BC003-B Switch assembly for BC590/760XLT $22.95
BC855XLT-B Bearcat 50 channel 12 band scanner $174.95
BC560XLT-B Bearcat 16 channel 10 band scanner .. $94.95
BP205-B Ni-Cad battery pack for BC200/100XLT $39.95
TRAVELLER2-B Grundig shortwave receiver $84.95
COSMOPOLIT-B Grundig shortwave receiver $179.95
SATELLIT500-B Grundig shortwave receiver $499.95
SATELLIT650-B Grundig shortwave receiver $849.95
ATS800-B Sangean shortwave receiver $89.95
ATS803-B Sangean shortwave receiver $159.95
74102-B Midland emergency weather receiver $34.95
77116-B Midland CB with VHF weather & antenna ... $66.95
77118-B Midland CB mobile with VHF weather $62.95
77913-B Midland CB portable with VHF weather $79.95
76300-B Midland CB base station $92.95
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FBW-B Frequency Directory for Western U.S.A. $14.95
RFD1-B MI, IL, IN, KY, OH, WI Frequency Directory . $14.95
RFD2-B CT, ME, MA, NH, RI, VT Directory $14.95
RFD3-B DE, DC, MD, NJ, NY, PA, VA, WV Directory $14.95
RFD4 AL, AR, FL, GA, LA, MS, NC, PR, SC, TN, VI . $14.95
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RFD6 CA, NV, UT, AZ, HI, GU Frequency Directory . $14.95
RFD7-B CO, KS, MO, NM, OK, TX Freq. Directory ... $14.95
PWB-B Passport to World Band Radio $16.95
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TTC-B Tune in on Telephone Calls $14.95
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TIC-B Techniques for Intercepting Communicatons .. $14.95
EEC-B Embassy & Espionage Communications $14.95
SMHV1-B Scanner Modification Handbook/Volume 1 $18.95
SMHV2-B Scanner Modification Handbook/Volume 2 $18.95
LIN-B Latest Intelligence by James E. Tunnell $17.95
A60-B Magnet mount mobile scanner antenna $39.95
A70-B Base station scanner antenna $39.95
USAMM-B Mag mount VHF ant. w/ 12' cable $39.95
USAK-B 3/4" hole mount VHF antenna w/ 12' cable .. $34.95

Add $5.00 shipping for all accessories ordered at the same time. Add $15.00 shipping per radio and $6.00 per antenna.

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Michigan residents please add 4% sales tax or supply your tax I.D. number. Written purchase orders are accepted from approved government agencies and most well rated firms at a 10% surcharge for net 10 billing. All sales are subject to availability, acceptance and verification. Prices, terms and specifications are subject to change without notice. All prices are in U.S. dollars. Out of stock items will be placed on backorder automatically or equivalent product substituted unless CEI is instructed differently. Shipments are F.O.B. CEI warehouse in Ann Arbor. Michigan. No COD's. Not responsible for typographical errors.

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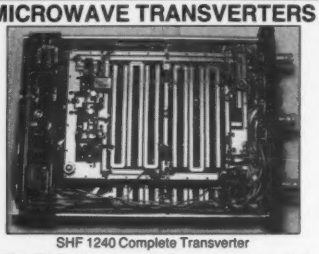
CIRCLE 121 ON READER SERVICE CARD

MICROWAVE TRANSVERTERS



SHF 1240 Complete Transverter

SHF SYSTEMS No tune linear transverters and transverter kits for 902, 1269, 1296, 2304, 2400, 3456 MHz. All use 2m i.f.g13.8V. Kits include mixer and L.O. P.C. boards, xtal and all components. Built units include I.F./D.C. switchboard, connectors and compact low profile housing. Other frequency options in amateur band available.

SHF 900K	902-906 MHz	50mW	Kit $139	Built $265
SHF 1240K	1296-1300 MHz	10mW	Kit $149	Built $265
SHF 1269K	1268-1272 Oscar Mode L	10mW	Kit $140	Built $255
SHF 2304K	2304-2308 MHz	10mW	Kit $205	Built $325
SHF 2401K	2400 MHz Mode S rcv Conv		Kit $155	Built $255
SHF 3456K	3456-3460 MHz	10mW	Kit $205	Built $325
SHF LOK	540-580 MHz L.O.	50mW	Kit $ 66	

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Linear Power Amps
for SSB, ATV, FM, 902—1296—2304—3456MHz

2304 PA	10mW in 5W out	1240-1300 MHz	$140
2318 PAM	0.5W in 18W out	1240-1300 MHz	$215
2335 PA	10W in 35W out	1240-1300 MHz	$325
2340 PA	1W in 35W out	1240-1300 MHz	$355
2370 PA	5W in 70W out	1240-1300 MHz	$695
3318 PA	1W in 20W out	902-928 MHz	$275
3335 PA	14W in 40W out	902-928 MHz	$335
1302 PA	10mW in 3.0W out	2304 MHz	$400
901 IPA	10mW in 1W out	3456 MHz	Write or Call

T/R Switching available, all 13.8 VDC

Low Noise Preamps & preamp kits—432, 902, 1296, 1691, 2304, 2401, 3456 MHz, 5.7 and 10 GHz.

33LNA	preamp .6 dB NF	902 MHz	13.8V	$ 95
23LNA	preamp .6 dB NF	1296 MHz	13.8V	$ 95
13LNA	preamp .7 dB NF	2300-2400 MHz	13.8V	$130
1691LNAWP	preamp 1 dB NF	1691 MHZ mast mounted	13.8V	$140
4017LNAK	preamp kit	400-1700 MHz	.6 dB	$ 40

Preamp kits for 2304-10 GHz — Write or Call

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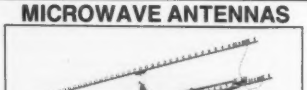
MICROWAVE ANTENNAS



Loop Yagis, Power Dividers, Stacking Frames, Complete Array of 902, 910, 1269, 1296, 1691, 2304, 2401, 3456 MHz. For Tropo, EME, Weak Signal, OSCAR, ATV, Repeaters, WEFAX, Commercial point to point. Available in kit form or assembled and tested.

3333LYK	33el	loop Yagi Kit	902 MHz	18.5 dBi	$ 95.00
2345LYK	45el	loop Yagi Kit	1296 MHz	21 dBi	$ 95.00
2445LYK	45el	loop Yagi Kit	1269 MHz	21 dBi	$ 95.00
1844LY	44el	loop Yagi (assem.)	1691 MHz	21 dBi	$105.00
2355LYK	55el	Superlooper Kit	1296 MHz	22 dBi	$108.00
1345 LYK	45el	loop Yagi Kit	2304 MHz	21 dBi	$ 79.00
945LYK	45el	loop Yagi Kit	3456 MHz	21 dBi	$ 79.00

Other models available. Call or write for catalog.

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switch, audio gain control, and a 3.5mm jack for stereo earphones. Order from Conversion Research (Frank Cathell K3YAZ), P.O. Box 535, Descanso CA 91916.

Project INSPIRE offers an opportunity for amateurs to be involved in a truly significant research project. To make it fully effective, we amateurs need to bridge the gap between the NASA shuttle experiment and local high schools. Pick up the phone and connect with the physics teacher at your neighborhood high school. If he (or she) hasn't heard about INSPIRE, have them send an SASE to Bill Pine for information. Offer to help students build the kit, and maybe give some advice and assistance in searching out a remote and radio-quiet listening site for the March 1992 mission. Good hunting on 60,000 meters!

Contact Jim Ericson KG6EK at 226 Charles Street, Sunnyvale CA 94086-6063.

Parts List

Resistors: Except for R-16, 1/4W metal film 5% units are preferred.

R1	470k
R2	47k
R3	2 Megohm
R4	15k
R5	2 Megohm
R6	680Ω
R7	220Ω
R8	20Ω
R9	33k
R10	10k
R11	4.7k
R12	10k
R13	6.8k
R14, R15	1k
R16	100k, audio taper
R17	10k
R18	11k
R19	22k
R20, R21	33k

Capacitors: 16 volt or higher.

C1	27 pF dipped silver mica
C2	0.01 µF ceramic or mylar
C3	0.10 µF ceramic or mylar
C4, C5	0.022 µF mylar
C6	0.01 µF ceramic or mylar
C7, C8	0.10 µF ceramic or mylar
C9	0.022 µF ceramic or mylar
C10	0.10 µF ceramic or mylar
C11, C12	0.01 µF mylar
C13	10 µF aluminum or tantalum
C14	1.0 µF aluminum or tantalum
C15	10 µF aluminum or tantalum

Active Devices

Q1	2N3819 or similar
Q2	2N2222A or similar
U1	TL082, LF353 or similar

Inductor

L1	1k c.t. to 8Ω miniature output transformer RS# 273-1380, Mouser 42KMO14, or similar

Miscellaneous

Ferrite bead	Amidon FB901-43 or similar
BP1,2	Binding posts
J1, J3	3.5mm mono jacks
J2, J4	RCA-type "phono" jacks
One 8-pin	IC socket
One 3.5mm	plug for power switch
Perfboard	RS# 276-150
Enclosure	5-1/4" x 3" x 2-1/8"
Battery	9V alkaline recommended. External supply up to 12V can also be used.
Battery clip	DC Electronics #1290 is good.
SW1, SW2	Miniature SPDT toggles
SW3	Toggle or slide OK.
Whip antenna	RS# 270-1408 or similar
Monitor amplifier	RS# 277-1008

NOTE: See text for kit availability.

73 Review

by Larry R. Antonuk WB9RRT

ZD Engineering Hardline Matching Transformers

ZD Engineering
605 Balsley Avenue
Findlay OH 45840
Tel. (419) 424-8765.
Price Class: $28–$30 per pair (available for any band between 144 and 1296 MHz). Other frequencies can be specially ordered—call for price quote. Two-port power divider—$40 including companion transformer.

A great way to use all of that cheap CATV cable!

Ham radio operators, in general, are a resourceful bunch. Most hams have some experience with making something out of nothing, and just about every amateur product advertised makes you say, "Why didn't I think of that??" The RF hardline matching transformers manufactured by ZD Engineering are just such an item. Not only do these matching transformers allow the use of very cheap CATV coax for ham radio, they also perform environmental and social services as well.

What's So Good About Hardline?

If you're new to ham radio, all of this interest in hardline may be somewhat confusing. After all, why deal with big holes in the wall and stiff, uncooperative cable, when a piece of RG-8 or RG-58 does the same job? The answer is cable loss.

Cable loss refers to the amount of power that is lost on the trip from the transmitter to the antenna. It varies from cable to cable. A percentage of your transmitter power is used up on the way to the antenna due to cable resistance and other factors. This "missing" power is turned into heat which dissipates along the cable rather than being radiated from the antenna.

As you might guess, cable loss increases as the cable gets smaller, and as the frequency gets higher. It also increases as the VSWR increases, which means that you lose even more power in the coax if the antenna isn't properly matched. Loss isn't much of a problem on the HF bands, but on VHF and above, it's a real concern.

For Example . . .

Consider a 2 meter transmitter feeding an antenna on a tower, with a coaxial cable length of 100 feet. An average loss factor for 100 feet of RG-8/U at 146 MHz might be 3.5 dB. A 100 ft. piece of 7/8" hardline has a loss factor of about 0.6 dB—a difference of almost 3 dB. What this means in terms of performance is that the same difference in radiated signal can be realized by either doubling your transmitter power—or by switching to hardline. (While different varieties of cable have different loss factors, the values presented here represent reasonable averages.)

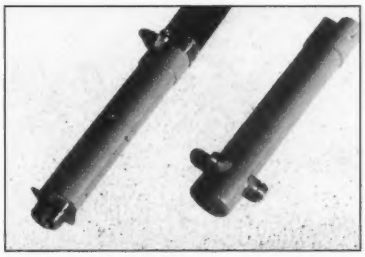


Photo A. 440 MHz Matching Transformer attached to 7/8" line, shown next to 440 MHz power divider.

Photo B. 440 MHz Matching Transformer terminated in a 50 ohm dummy load.

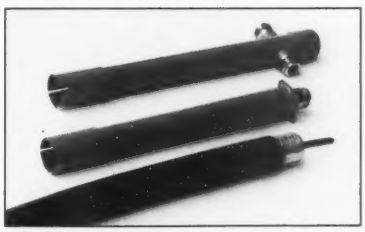


Photo C. 7/8" line prepared for installation of matching transformer and power divider.

If hardline is such great stuff, why isn't everyone using it? As usual, the answer is money! Prices vary, but a good estimate of communications grade hardline, in amateur quantities, is right around "several bucks a foot." Yikes! Not only that, but even if you can get the line for free, the connector prices are prohibitive.

As luck would have it, there is one source of free (or nearly free) hardline. The type of cable used for main runs by CATV companies turns out to be a very high grade of hardline, and it comes in 1/2", 3/4", and 7/8" inch sizes. These cables typically run for miles, and a "short end" to a cable company is often anything less than 500 feet. These "short ends" are often available for the asking—nice long sections of low-loss hardline—just haul them away. But there is one problem—it's 75 ohm impedance cable. And then, you still need to buy those expensive connectors.

The Solution

Fully aware of all of the above facts, the folks at ZD Engineering put two and two together and came up with six. The ZD Engineering Hardline Matching Transformers allow the use of standard CATV hardline for communications use. Each adapter consists of an appropriate connector (UHF or N) and a quarter-wave matching section that mounts on the end of the hardline.

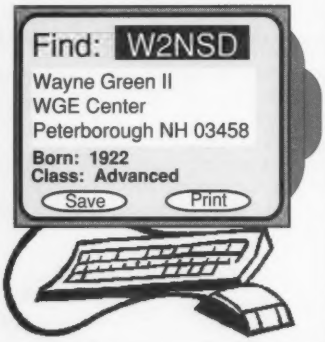
A pair of matching transformers turns a piece of hardline into a flat 50 ohm transmission line (for only $30). It may seem like magic, but the ZD Adapter impedance transformer trick is based on straightforward transmission line theory. One characteristic of a quarter-wave section of transmission line is that it has the ability to match two unequal impedances provided that the impedance of the quarter-wave matching section is of a specific value. The value happens to be the square root of the

Typical Attenuation Figures for 1/2" CATV Hardline

Frequency (MHz)	dB/100 ft.
5	0.16
30	0.40
55	0.54
150	0.90
220	1.11
425	1.57

1992

Throw away your magnifying glass...



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PC 1.2 Meg 5.25" disks	**69.95**
WHamBase (program only)	**19.95**
HBPopup (program only)	**19.95**

UPS Shipping included.
CA residents please add sales tax.

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CIRCLE 270 ON READER SERVICE CARD

product of the two values to be matched—in our case, 50 and 75 ohms.

The value of the matching section therefore needs to be 61.2 ohms. The ZD Hardline Adapter is simply a quarter-wavelength line, built to the size necessary to produce a 61.2 ohm impedance. The line is then machined to allow mounting to the desired size of hardline, and a connector is silver-soldered to the other end. Although straightforward in design, the adapters provide a feature that makes installation a snap, and prevents a problem that's often experienced with lines of this type.

One of the main difficulties experienced with long runs of CATV hardline has to do with the amount of expansion and contraction that the copper-coated aluminum center conductor undergoes with changes in temperature. Expansion can cause the center conductor to move within the coax, stressing the connections. In extreme cases, the contraction of the center conductor will be so great that it will recede back into the dielectric by several inches.

The ZD Hardline Transformers eliminate this problem by providing a receptacle that's machined to allow the insertion of several inches of center conductor (in the 146 MHz version, the center conductor could be left up to two feet long). This extra length of conductor means that the connection will be making contact regardless of thermal expansion or physical movement.

The coax is simply slid into the adapter, and the inner receptacle holds the center conductor firmly in place. The outer conductor of the adapter is then clamped to the shield of the coax, holding the whole assembly in place. No soldering, threading, or special tools. The ZD Adapters come with explicit installation instructions, and a small amount of anti-oxidizing compound is included in the hardware package.

Transformers are available for 144 MHz, 222 MHz, 440 MHz, 903 MHz, and 1296 MHz. In addition, straight connectors (with no matching section) are available, as are power dividers.

But Do They Work?

The proof of the pudding is in the transmitting, and in this case the ZD Transformers worked just as expected. A series of tests was run using both 7/8" and 1/2" line, at power levels of 10 and 100 watts.

In all cases the measured loss was exactly what was expected from the coax itself—the transformers introduced negligible, if any, additional loss. (See the Table for typical hardline loss figures.) In addition, the transformers produced an absolute flat match into a 50 ohm dummy load. (Due to their high quality construction, the quarter-wave sections probably have a lower loss factor than the cable itself.)

Installation Tips

At this point, it may seem like the ZD Transformers are almost too good to be true. There are a couple of slight limitations that should be noted. First, the physical construction of the adapters could allow water to infiltrate under the outer cable jacket if proper waterproofing methods aren't taken. This can obviously be prevented by the careful use of Coax Seal™. The instructions that come along with the ZD Transformers state that you should wrap Coax Seal so that it overlaps two inches on each side of the junction of the transformer and the hardline. You should make sure the clamp is covered completely by sealant as well.

Second, the length of the adapter is rather long compared to the length of the section of coax that the adapter clamps onto, especially in the 2 meter version. This means that any movement of the adapter will be felt at the cable junction with a fair amount of leverage.

The adapters and the cable should be physically secured to a solid structure (the tower leg or, if indoors, a wall) to keep them from moving, and flexible coax jumpers should make the final connections to the antenna or transmitter. This is common practice in the commercial radio field, but may be something new to some amateurs.

Obviously, these two points are a minor trade-off in order to obtain a piece of low-loss line, but they should be carefully addressed. (The loss factor of hardline increases dramatically if the line is filled with water!)

Saving the Earth

Skeptical by nature, the author decided to check out the claims of all this low cost hardline available at cable TV companies. Obviously, the true value of a product like the ZD Transformer is directly related to how cheaply one can get the hardline. After calls to three cable companies in the area, it was clear that the term "low cost hardline" was something of a misnomer.

More correctly, it should be called "Free—how much do you want?" or perhaps, "We'll give you a few bucks to haul it away" hardline. Environmental awareness, landfill problems, and recycling have finally caught up with the CATV companies. Those "short ends" we were discussing earlier have to go someplace, and the landfill doesn't want to deal with them.

Aluminum scrap collectors used to burn the jacket off and salvage the metal, but burning the cable produces toxic gases—no longer an option. In most cases the short ends and old replaced cable are thrown in a pile, and someone who specializes in scrap cable comes by once a year—and *charges* to haul it away.

One CATV manager proudly told of a deal he worked with a scrap dealer concerning a run of existing cable that was being replaced. After a day on the phone, he finally found someone who would come and get the TWELVE MILES of old 7/8" cable and haul it away in exchange for the aluminum value—a real coup.

Obviously, the cable companies want to get rid of this stuff. Not only are you going to set yourself up with a very low loss antenna line system, saving a load of money in the bargain, you're also doing the Earth a favor. And the social implications? Just think how happy things will be around the house—once you tell the XYL how you saved a thousand dollars on hardline by using ZD Matching Transformers, and then only spent five hundred dollars on a new rig.

Now why didn't I think of that? 73

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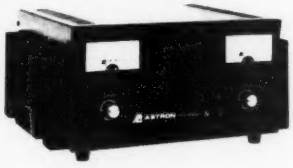

MODEL VS-50M

SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
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PERFORMANCE SPECIFICATIONS

- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- All units available in 220 VAC input voltage (except for SL-11A)

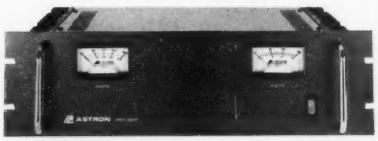
SL SERIES

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• LOW PROFILE POWER SUPPLY						
SL-11A	•	•	7	11	2¾ x 7⅝ x 9¼	11

RS-L SERIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE				
RS-4L	3	4	3½ x 6⅛ x 7¼	6
RS-5L	4	5	3½ x 6⅛ x 7¼	7

RM SERIES



MODEL RM-35M

• 19" RACK MOUNT POWER SUPPLIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-7B	•	•	5	7	4 × 7½ × 10¾	10
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46

VS-M AND VRM-M SERIES

MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

• Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 16 ON READER SERVICE CARD

73 Review *by Bill Clarke WA4BLC*

The Yaesu FT-990

A fully-equipped transceiver for the everyday ham.

Yaesu USA
17210 Edwards Road
Cerritos CA 90701
(213) 404-2700
Price Class: $2,400

The FT-990 is advertised as incorporating many of the features found on the FT-1000, yet leaving out some that most hams would seldom use. The result is a fully-equipped transceiver somewhat more affordable than the FT-1000, and more applicable to the typical ham. (See the sidebar for a list of some of the FT-990's features.)

The Yaesu FT-990 HF transceiver.

Operating

Getting the FT-990 on the air was straightforward and took just a few minutes. Only two things are required to operate the rig: AC power and an antenna. This is a complete HF ham station in a single box.

If you are just entering the microprocessor rig era you may find the large number of controls rather formidable, but don't be daunted. The FT-990 is really a very simple rig to operate and the dexterity it offers will be warming to any operator. Most functions are selected via microprocessor control buttons, in contrast to the old wafer switches of yesteryear with their thump-and-bump knobs.

Frequency selection is done with the main tuning knob, which has a very heavy, yet smooth feel. Actually, this can be said for all the controls on the front panel. They operate smoothly and are good-looking. Keypad selection of frequency is simple (except for adding a leading zero below 10 MHz) and, after the memories have been set, selection can be made directly from the memories. There are 90 memories, all tunable and scannable. Of course, there are two VFOs. The frequency readout is excellent and the display also monitors mode, memory number, VFO in use, tuning speed, and clarifier offset (RIT).

The automatic antenna tuner does its work quickly, even when not operating from one of its 39 memories. Typically, it only takes a few seconds. The received audio is a little mushy, to my ears, when all controls are open or centered, but slight adjustments to the DIGITAL FILTER and SHIFT controls make it real sharp (more about these features later). My transmitted audio got many unsolicited reports of "audio really sounds good," which is notable because I was using the hand-mike that came with the rig.

Overall, it is the quality and action of the FT-990's controls that impressed me the most.

Receive Performance

My antenna system is designed to instantly switch from one rig to another, and can be set to parallel rigs on the same feedline. This provides a means to compare performance. During the review process, I operated only in SSB, FM, AM, and CW modes, even though the FT-990 is built with internal interfaces for digital modes (RTTY, packet, AMTOR). I was very pleased with the general receiving capabilities of the FT-990 and I feel it will meet most needs. I still think that the FT-1000 has what I feel to be the ultimate receiver, but it is, after all, more expensive than the FT-990.

The rig I tested had the 2 kHz SSB and 250 Hz filters installed. I found that for signal separation, using these optional filters gave a distinct edge. Overall, the receiver is very tight and does not appear to suffer overloading problems caused by nearby strong signals.

Features and Comments

The Digital SCF filtering is super! I cannot say enough good about this feature. I used it often and was very pleased with its power and ease of operation. The filter consists of two controls that limit the audio bandwidth of the received signal. One cuts out the highs and the other the lows. Both are infinitely selectable and have very steep skirts. This filter is a real plus that isn't even found on the FT-1000.

The SHIFT (IF passband) control is great to use, smoother and broader (easier to tune) than most other rigs. Although the NOTCH FILTER works like it should, I've found that there are some tremendous automatic notch filters in the add-on market. It'd sure be great to see this kind of noth filter available in commercial rigs.

The RF FSP speech processor is unique in that it has a provision for shifting your transmit frequency. It is most effective during pile-ups. The slightly higher-sounding audio really cuts through. Just don't use it on 75 and 40 for local work. You won't be liked very much. This feature can be cloned by operating split, using two VFOs, or by using RIT. But, I doubt if you would consistently be as good sounding or as effective as the FT-990.

If you have never used a rig with an automatic antenna tuner, treat yourself to it sometime. I used multiband wire and vertical antennas for most of my HF work and found the 990's automatic tuner to be perfect for fast QSY. It tuned everything I normally use, with no problems. It did balk at working with my linear amplifier, so in those situations I turned the tuner off.

There is a nice feel to the tuning knob and all the controls are of excellent quality both visually and functionally.

The front feet on the rig are far nicer than the typical wire bails found on most rigs. They drop out of the case bottom, are round, and large in diameter. They are also non-slip!

For the CW operator, a built-in iambic memory keyer with dot/dash memory and selectable weight is standard. The keyer can even be set to simulate a bug. The BFO frequency is adjustable, and a SPOT button allows for precise tuning. A 500 Hz CW filter is standard with 250 Hz optional.

Each of the 90 memories stores frequency, mode, bandwidth, and clarifier (RIT) settings. They are scannable, perhaps nice for keeping track of activity on favorite nets or for FM.

The DVS-2 digital voice recorder (optional device) is basically a solid-state tape recorder.

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BG28:	Bargraph Signal Level Indicator	$100.
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CIRCLE 28 ON READER SERVICE CARD

It is convenient for calling CQ and, with the four short message sections, can be set up to XMIT most of a contest contact. Recording off-the-air is a good feature for repeating missed calls and contact numbers. In addition, as many hams really do wonder what they sound like on the air, particularly when making mike and/or audio changes to their stations, being able to play back on the air is a great feature.

Yaesu does not recommend long transmissions at full power on the FT-990 when operating digital modes. They suggest operating at half power.

The Manual

The manual for the FT-990 includes an excellent tutorial to get you going and does a good job of explaining the function of each control. It is a must-read booklet, as it contains instructions for customizing the transceiver for your own operation (power-up selections). I found the manual lacked some specifications (no stated dynamic range).

Customizing the FT-990

You can customize some of the operations of the FT-990 to suit your particular desires by instructing the rig how to come on when powered up (turned on).

Power-up selection choices are made by holding specified keys/buttons while switching the FT-990 from "off" to "on," and by using DIP switches. Once selected, these choices will be included every time the rig is turned on (until you change them). Some power-up selections are: method of frequency display (offsets for different modes), beeper on/off and pitch, 10 Hz readout, CW pitch, and sidetone volume. This capability makes it easy to turn the 990 into *your* radio.

Recommendations

At a suggested list price of $2,399 you will be getting a high-grade transceiver loaded with bells and whistles, internal power supply, automatic antenna tuner, and digital SCF audio filtering. The rig is also ready for any current digital mode.

Putting these prices into perspective, the FT-990 isn't such a case of sticker shock after all. All you need for general operation is a single all-band antenna such as a G5RV or Windom, a feedline, and a place to plug in the FT-990.

Would I recommend the FT-990? Yes, it offers the features most hams are looking for. Its controls are smooth and very effective, particularly the digital SCF audio filter and shift tuning. And, let's face it, the rig does look pretty darn good! 73

Some Features of the FT-990

- Keypad direct frequency entry
- Passband shift
- 90 memories
- Automatic antenna tuner
- Dual digital SCF (switched capacitance filter) audio filter
- Noise blanker
- RF FSP (frequency-shifted speech processor)
- All-mode squelch
- Notch filter (manual)
- Iambic memory keyer
- Selectable BFO offset
- Spotting button
- Key jacks on front and rear panels
- Dedicated interfaces for RTTY, AMTOR, and packet
- Internal switching AC power supply
- DVS-2 digital voice recorder (optional)
- 10 meter FM operation

SPECIFICATIONS (as taken from the FT-990 Operating Manual)

General
- RCVR Coverage: 100 kHz–30 MHz
- XMIT coverage
  - 160 1.8– 2.0 MHz
  - 80 3.5– 4.0 MHz
  - 40 7.0– 7.5 MHz
  - 30 10.0–10.5 MHz
  - 20 14.0–14.5 MHz
  - 17 18.0–18.5 MHz
  - 15 21.0–21.5 MHz
  - 12 24.5–25.0 MHz
  - 10 28.0–29.7 MHz
- Frequency Stability
  - <10ppm (−10 to +50 degrees C)
  - <0.5 ppm (w/TCXO-2 option)
  - On FM: <200 Hz
- Emission modes
  - LSB/USB-CW-FSK-AM-FM
  - (J3E-A1A-J1D-J2D-A3E-F3E)
- Basic frequency steps
  - 10 Hz LSB/USB-CW-FSK(J1D)
  - 100 Hz AM-FM-FSK(J2D)
- Antenna Impedance: 16.5–150 Ω (50 Ω nominal)
- Power requirements
  - Voltage: 110–117 or 200–234 VAC 50/60 Hz
  - Amperage: 60 VA on RX/470 VA on TX
- Dimensions (WHD) 14.3″ x 5″ x 14.4″
- Weight: 28.6 lbs.

Transmitter
- Power output
  - 100W (adjustable)
  - (25W on AM)
- Duty cycle
  - 100%
  - (50% FM & RTTY)
- Modulation types
  - SSB–Balanced filtered carrier
  - AM–Low-level (early stage)
  - FM–Variable reactance
  - FSK–Audio frequency shift keying
- Maximun FM deviation: ±2.5 kHz
- FSK shift frequencies: 170/425/850 Hz
- Packet shift frequencies: 200/1000 Hz
- Harmonic radiation: <50 dB below peak output
- SSB carrier suppression: <40 dB below peak output
- Undesired sideband suppression: <50 dB below peak output
- Audio response: <−6 dB (400–2600 Hz on SSB)
- 3rd order IMD: >−36 dB (100 W PEP at 14.2 MHz)
- Microphone impedance: 500–600 Ω

Receiver
- Circuit type: Triple-conversion superheterodyne
- IF frequencies: 47.21/10.94/.455 MHz
- Sensitivity
  - 10 dB S/N, 0 dB = 1 µV
  - SSB/CW 100–500 kHz <1 µV
  - SSB/CW 0.5–1.8 MHz <2 µV
  - SSB/CW 1.8–30 MHz <0.25 µV
  - AM 100–250 kHz <10 µV
  - AM 250–500 kHz <2 µV
  - AM 0.5–1.8 MHz <4 µV
  - AM 1.8–30 MHz <1 µV
  - FM 29 MHz for 12 dB SINAD <0.5 µV
- Selectivity
  - 6.0 kHzAM Wide: 6 kHz, −6 dB; 15kHz, −60 dB
  - 2.4 kHzSSB/AM/CW/RTTY/Packet: 2.2 kHz, −6 dB;4.0 kHz, −60 dB
  - 2.0 kHzSSB/CW/RTTY/Packet: 1.8 kHz, −6 dB; 3.6 kHz, −60 dB
  - 500 HzCW/RTTY/Packet: 500 Hz, −6 dB; 1.8 kHz Hz, −60 dB
  - 250 HzCW/RTTY: 240 Hz, −6 dB; 700 Hz, −60 dB
- Squelch sensitivity
  - 1.8–30 MHz (CW,SSB,AM): <2 µV
  - 28–30 MHz (FM): <0.32 µV
- IF rejection: >80 dB (1.8–30 MHz)
- Image rejection: >80 dB (1.8–30 MHz)
- IF shift: ±1.2 kHz
- Maximun Audio output: 2W into 4 Ω load w/<10% THD
- Audio output impedance: 4–8 Ω

BayCom Modem

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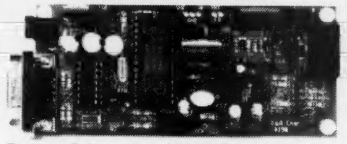

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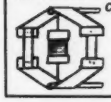

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HT'S

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TH-27A	2M 2-5W MICRO 40ME	419.95	CALL
TH-47A	70CM 2-5W MICRO	429.95	CALL
TH-415	70CM 2W SCANNG DEL	419.95	CALL
TH-77A	2M/70CM DEL DUAL B	599.95	CALL

MOBILE VHF/UHF

MODEL	DESCRIPTION	LIST	OURS
TM-241A	2M 45W PROG MIC	469.95	CALL
TM-331A	220MHZ 25W PROG MIC	489.95	CALL
TM-441A	440MHZ 25W PROG MIC	479.95	CALL
TM-631A	2M/220MHZ DUAL BAND	749.95	LMTD CALL
TM-791A	2M/70CM/? TRIBANDER	849.95	CALL
TM-741A	2M/70CM/? TRIBANDER	849.95	CALL
TM-941	2M/440M/1.2 TRI-BAN	1199.95	CALL
TM-751A	2M 25W ALL-MODE	699.95	CALL
TS-711A	2M 25W ALLMODE BASE	1059.95	CALL
TS-790A	2M/70CM SATELLITE	1999.95	CALL

HF EQUIPMENT

MODEL	DESCRIPTION	LIST	OURS
TS-140S	HF COMP GEN COV	949.95	CALL
TS-690S	HF/6M COMP GEN COV	1549.95	CALL
TS-450S	HF DELUXE COMP	1349.95	CALL
TS-450S/AT	HFDEL COMP TUNR	1549.95	CALL
TS-850S	HF 12V DEL DDS	1899.95	CALL
TS-850/AT	HF 12V DEL TUNR	1999.95	CALL
TS-950S	HF BASIC VERSION	3299.95	CALL
TS-950SD	HF THE DX MACHINE!	4399.95	CALL

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HT'S

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IC-2GAT	2M 7W 15MEM DTMF	429.00	CALL
IC-2SAT	2M 2-5W DEL MICRO	439.00	CALL
IC-2SRA	2M/SCANNER HT	599.00	CALL
IC-24AT	2M/70CM DEL MICRO	499.95	CALL
IC-3SAT	220M 2-5W MICRO	449.00	CALL
IC-4SAT	70CM 2-5W MICRO	449.00	CALL
IC-4SRA	70CM/SCANNER HT	599.00	CALL
IC-4GAT	70CM 7W 15MEM DTMF	449.00	CALL
IC-W2A	2M/70CM DUAL MICRO	629.00	CALL

MOBILE VHF/UHF

MODEL	DESCRIPTION	LIST	OURS!
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IC-229H	2M FM, 45W 20MEM	479.00	CALL
IC-3220A	2M/70CM 25W 40MEM	659.00	CALL
IC-3220H	2M/70CM 45W 40MEM	699.00	CALL
IC-2410	2M/70CM 45W DEL.	TBA	CALL

HF EQUIPMENT

MODEL	DESCRIPTION	LIST	OURS!
IC-725	HF COMPACT GEN COV	949.00	CALL
IC-726	HF/6M COMP GEN COV	1299.00	CALL
IC-735	HF DELUXE COMPACT	1149.00	CALL
IC-751A	HF 12V BASE TXCR	1699.00	CALL
IC-765	HF DELUXE TNR,PS	3149.00	CALL
IC-781	HF DX'ERS DELIGHT	6149.00	CALL

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HT'S

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FT-811	70CM 2-5W 50MEM	405.00	CALL
FT-470	2M/70CM 2-5W 50MEM	491.00	CALL
FT-26	2M-5W WITH/DTMS PAGING	349.00	CALL
FT-76	440MHz-5W WITH/DTMS PAGING	399.00	CALL

MOBILE VHF/UHF

MODEL	DESCRIPTION	LIST	OURS
FT-290RII	2M 25W ALL-MODE	610.00	CALL
FT-690RII	6M 10W ALL-MODE	752.00	CALL
FT-736R	2M/70CM 220/1.2 SAT	1922.00	CALL
FT-5200	2M/70CM DUAL BAND	749.00	CALL
FT-8200	70CM/1.2 DUAL BAND	899.00	CALL
FT-2400H	2M 50W,LCD,CTCSS	419.00	CALL

HF EQUIPMENT

MODEL	DESCRIPTION	LIST	OURS
FT-747GX	HF LGTWGT MOBILE	869.00	CALL
FT757GXII	HF COMP GEN COV	1089.00	CALL
FT-767GX	HF 2/220/70C TUNR	2299.00	CALL
FT-990	HF 12V DEL TUNR+	2399.00	CALL
FT-1000B	HF BASIC VERSION	3399.00	CALL
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HF EQUIPMENT—AMERICAN MADE

MODEL	DESCRIPTION	LIST	OURS
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CIRCLE 162 ON READER SERVICE CARD

The QUAG-V

A high performance and wide bandwidth antenna for VHF and UHF.

by Leonard Shick WB3AYW

A broadband antenna is a must for 440–450 MHz. The main problem of most antennas (as well as the matching system) for this band is the ability to achieve a low VSWR over a wide bandwidth while maintaining a high gain. This limits most antennas to a bandwidth of 1 or 2 MHz. By using quagi dimensions for directors and all spacings, the bandwidth of the driven element can be widened to 10 MHz by changing the driven element and the reflector to the double quad design, then bending them at a 90 degree angle. When this is done, all three radiating elements on the driven element reinforce each other at the first director for added gain on both receive and transmit.

In an antenna system with two quad loops driven at the center, there is an impedance of approximately 75 ohms. When used in an array, this can drop to around 50 ohms, which can be driven with 50 ohm coax directly without any matching device. This helps with the simplicity of the easy-to-build broadband design.

Construction Details

The antenna is made from #10 AWG house wiring because of its stiffness and low cost. The boom is made from wood (1″ x 2″ pine for 70cm and 1″ x 3″ for 2m). DO NOT USE METAL, as it will interfere with the element length and radiation pattern.

Using a #39 bit, drill all the holes in the boom, except the one for the driven element, which does not get drilled completely through. The undrilled part of the boom between the two holes keeps the two wires from

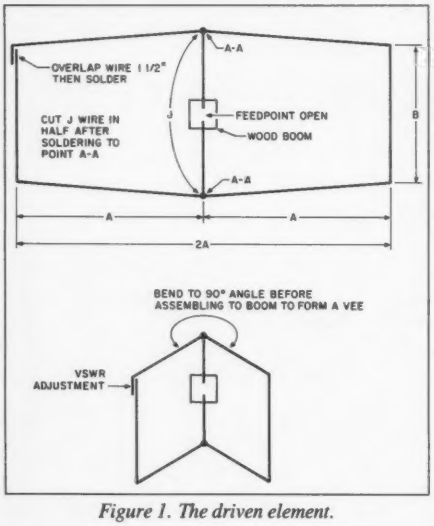

Figure 1. The driven element.

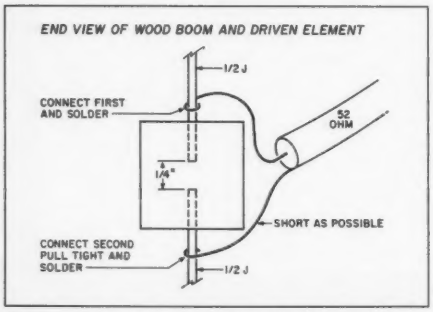

Figure 2. Feedline connection to the driven element.

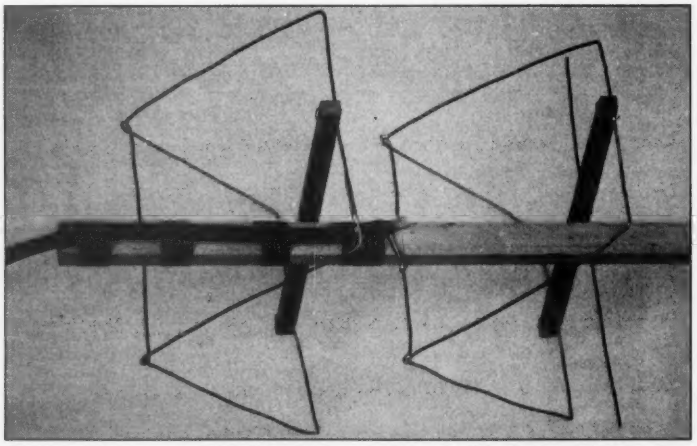

Photo A. Close-up view of the driven element, reflector and feedline attachment point.

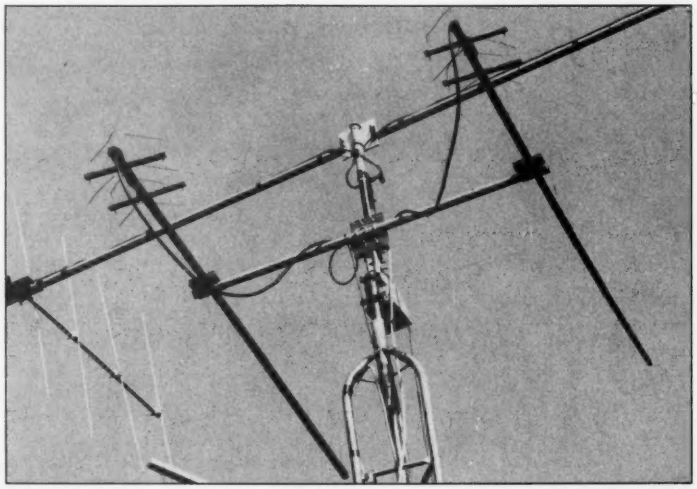

Photo B. Two Quag-Vs can be stacked for additional gain. If you mount the Quag-Vs for horizontal polarization in the configuration shown, you must use a wooden or fiberglass cross support.

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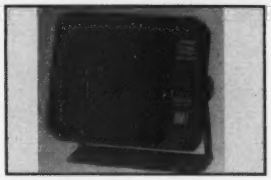
Power & SWR Meter

MR1000 .....$109.00
MR2000 .....$129.00

Freq. Range: 3.5-200MHz/130-512 MHz
Meas. Pow. Ranges: 0-50W/0-200W CW
Input Impedance: 50Ω
Insertion Loss: Less than 0.5dB
Residual SWR: Within 1.2
145MHz (MR1000)/435MHz (MR2000)
Connector: SO239 (MR1000), N (MR2000)
Size: 2.75" x 6.22" x 4.41" (HxWxD)
Weight: 1.25 lbs.

Trunk/Hatch Mount
BM1.....$29.00
Matte Black Finish

Zinc Die-Cast
Adjustable Mounting Angle
Weight: .76 lbs.
Features: Inserts for the protection of your vehicle while mounted.



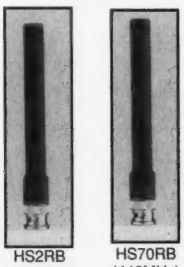
Speaker
HSP6000.....$29.00

4 Inch fixed cone speaker with high quality noise filter
Max. Input: 15W
Impedance: 8Ω
Weight: .94 lbs.
Connector: 3.5 mm plug
Size: 4.33" x 5.32" x 2.13" (HxWxD)

Speaker
HSP7000 .....$37.00

2.75 Inch fixed cone speaker (high quality, deluxe magnet mount type)
Max. Input: 8W
Impedance: 8Ω
Weight: .67 lbs.
Connector: 3.5 mm plug
Size: 3.51" x 4.06" x 1.42" (HxWxD)

Handy Whip Antennas 144/440 MHz



HS2RB (144MHz) HS70RB (440MHz)

HS2RB $12.80
HS70RB ..$12.80

Material: Silicone Rubber
Max. Input: 5W (FM)
Length: 4.33 "/110mm
Weight: .05 lbs.
Connector: BNC- Male

3 Band HT Deluxe Black Whip

144/440/900MHz
HG600B ..$37.80

Freq.: 144/430/900MHz
Gain: - - (144MHz)
1.9dB (430MHz)
3.6dB (900MHz)
Max. Input: 10W (FM)
Length: 12.5 "/320 mm
Weight: .16 lbs.
Connector: BNC- Male

10 Meter Horizontal Beam

28 MHz
28HS2HB.....$99.50

Max. Input: 500W (SSB), 250W (FM)
Gain: Better than 6.0 dB
FBR: Better than 16 dB
Element Length: 5,400 mm/17' 8"
Boom Length: 1,340 mm/4' 5"
Shipping Weight: 7 lbs., 13 oz.
Connector: SO239 Jack

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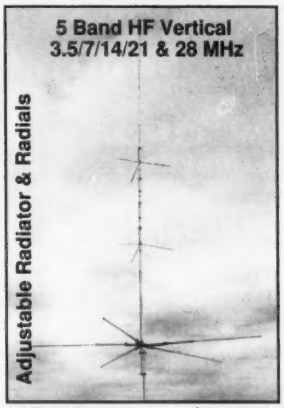
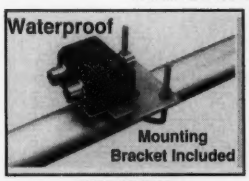
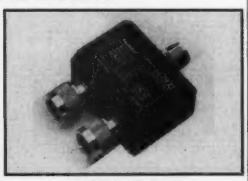


HSVK5JR.....$287.00

Max. Input: 500W SSB, 250W CW, 3.5 MHz - 200W SSB
Height: 20', Radial: 10' 2"
Shipping Weight: 17 lbs., 8 oz.
Connector: SO239 Jack
UPS Shippable

LOW-LOSS DUPLEXERS





HS790WP **HS790D/DN**

Frequency: 1.6-150MHz (LPF)/410-460MHz (HPF)
Power: 1.6-30MHz 500W(F3) 1kW (A3J)
30-150MHz 300W (F3) 500W(A3J)
410-460MHz 300W(F3) 500W (A3J)
Insertion Loss: 1.6-150MHz 0.15dB
410-460MHz 0.25dB
VSWR: Less than 1.2
Isolation: 60dB more
Size: 1.2" x 2.5" x 1.9" (HxWxD) (Excluding Protuberance)
Input Connectors: SO239

HS790WP...$58.00
Direct Link
Output: SO239 x 2

HS790D.....$47.50
Direct Link
Output: PL259 x 2

HS790DN ...$47.50
Direct Link
Output: PL259 x 1 , N x 1

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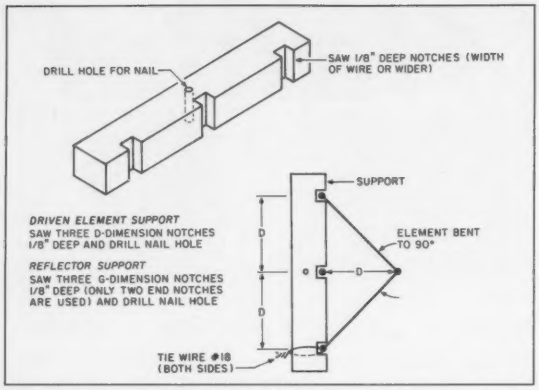
DRILL HOLE FOR NAIL
SAW 1/8" DEEP NOTCHES (WIDTH OF WIRE OR WIDER)
SUPPORT
DRIVEN ELEMENT SUPPORT
SAW THREE D-DIMENSION NOTCHES 1/8" DEEP AND DRILL NAIL HOLE
REFLECTOR SUPPORT
SAW THREE G-DIMENSION NOTCHES 1/8" DEEP (ONLY TWO END NOTCHES ARE USED) AND DRILL NAIL HOLE
ELEMENT BENT TO 90°
D
G
TIE WIRE #18 (BOTH SIDES)

Figure 3. Top view of the driven element and reflector support. The elements are held in place by short loops of #18 wire as shown. The "D" dimensions are used for the driven element and the "G" dimensions are for the reflector assembly (see Table 2).

Table 1. Director Lengths (in inches)

	432	438	446	448	146
D1	11-3/8	11-1/4	11-1/16	11	33-3/4
D2	11-5/16	11-3/16	11	10-15/16	33-5/8
D3	11-1/4	11-1/8	10-15/16	10-7/8	33-1/2
D4	11-3/16	11-1/16	10-7/8	10-13/16	33-3/8
D5	11-1/8	11	10-13/16	10-3/4	33-1/4
D6	11-1/16	10-15/16	10-3/4	10-11/16	33-1/8
D7	11	10-7/8	10-11/16	10-5/8	33-1/8

D8, etc.: Same as D7.

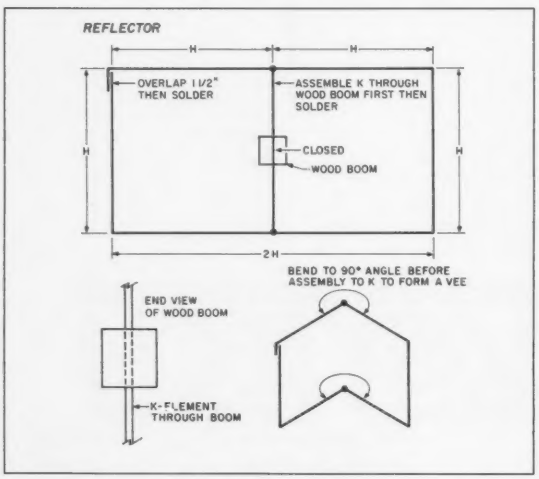

Figure 4. The reflector.

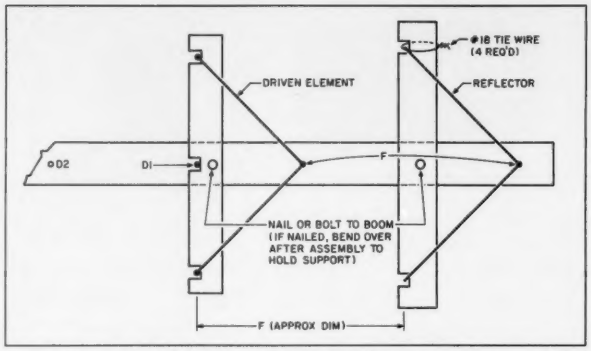

Figure 5. Top view of the driven element and the cross support assembled and attached to the boom.

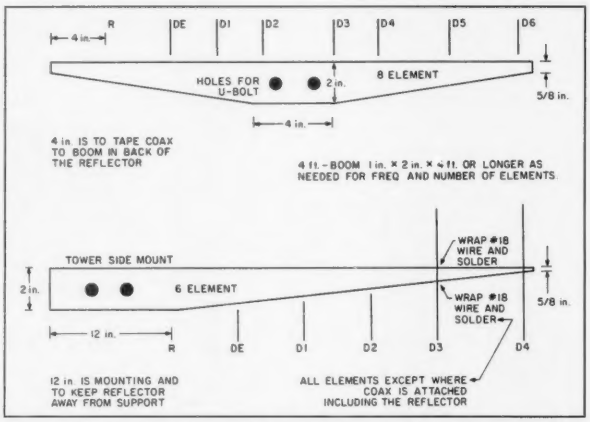

Figure 6. Boom dimensions and element locations. Although not required, you can taper the boom as shown to lighten the total weight of the antenna.

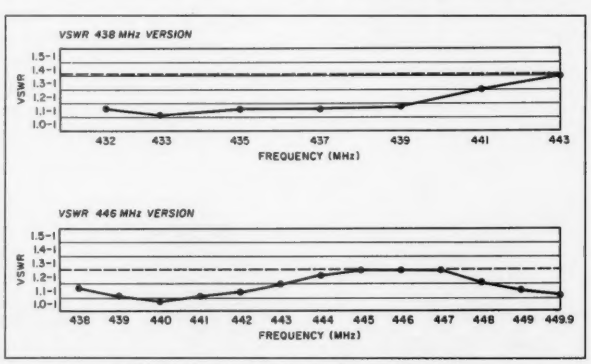

Figure 7. VSWR plots for the 438 MHz and 446 MHz versions.

touching at the feedpoint, and is also the driven element center support (see Figures 1 and 2).

The directors must be cut for the higher portion of the band to be used, so as not to act as reflectors at the highest frequency used. When making the directors, cut carefully, file both ends flat, and then deburr to get the correct length. (A burr on one end of an element can change the length by one MHz or more.)

When mounting the directors, wrap some #18 bare wire around the directors on both sides of the boom, then solder so that the elements will not slide down through the boom.

If the antenna is to be stacked side by side for vertical radiation, the mast can be metal as it will not affect the pattern. For horizontal operation, the mast and supporting structure should be nonmetallic if they are in the field of the radiation pattern.

The support for the front of the driven element and reflector is made of wood, approximately 1/4" x 1" x 12" long. The center of the two wood cross supports is held in place by a nail approximately 2" long, bent over to hold the support from moving. Three notches position the elements in place and two #18 tie wires hold and support the elements to the supports. This ensures that all three vertical elements are the same distance from the first director.

The coax should go from the driven element back through the reflector, then be looped back to the supporting structure. The mast should be of a non-conducting material: wood, fiberglass, etc. A metal mast will change the gain and pattern of the system.

Tuning

When the antenna is complete, adjust the

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VSWR by unsoldering the side of the driven element where it is soldered together, then slide it to increase or decrease the length. When you have completed the antenna, and before installation, coat the wood with a latex-base finish to protect it from the weather.

This antenna is similar to the parabeam ("J" beam), but uses the quagi spacings and is bent so that the first director is in line with the outside of the driven element.

At the 1991 W3MIE Field Day, site tests were conducted on the 440–450 QUAG-V, and it showed a much-improved gain and bandwidth over a quagi of the same size.

Table 2. Driven element and reflector dimensions (in inches).

Frequency (MHz):		432	438	446	448	146
Element dia. # wire	A	7-3/8	7-7/16	7-1/8	7	21-3/4
	2A	14-3/4	14-7/8	14-1/4	14	43-1/2
	B	5-5/8	5-5/8	5-1/2	5-7/16	16-1/8
	D	4-5/8	4-9/16	4-3/8	4-3/8	13-5/8
	G	5-9/16	5-9/16	5-3/8	5-1/8	14-7/8
	J	6-3/4	6-5/8	6-1/2	6-7/16	19-3/8
	F, H, K	7-1/16	7-1/16	6-7/8	6-13/16	21
Total length of D.E., including overlap		42-1/4	41-3/8	41	40-3/8	120-3/4
Total length of ref., incl. overlap		43-7/8	43-5/8	42-1/4	42	127-1/2
	2H	14-1/8	14-1/8	13-3/4	13-5/8	42

Table 3. 8-Element Material List

Frequency (MHz):	432	438	446	448	146
#10 wire	103″	103″	103″	103″	—
#6 wire	—	—	—	—	26′
Boom (pine or redwood)	1″ x 2″ x 55″	1″ x 2″ x 55″	1″ x 2″ x 55″	1″ x 2″ x 55″	1″ x 3″ x 12′
Cross supports (2)	1/4″ x 1″ x 12″	1/4″ x 1″ x 12″	1/4″ x 1″ x 12″	1/4″ x 1″ x 12″	1″ x 1″ x 32″
Sealant for boom and cross supports	1/2 pint	1/2 pint	1/2 pint	1/2 pint	1 pint
U-bolts	1-1/4″ x 3″ (1)	1-1/4″ x 3″ (1)	1-1/4″ x 3″ (1)	1-1/4″ 3″ (1)	1-1/4″ x 3″ (2)
Tie wire #18	15″	15″	15″	15″	24″ #16

Table 4. Element Spacing (in inches)

Frequency (MHz):	432	438	446	448	146
R–DE	7	6-15/16	6-13/16	6-3/4	20-5/8
DE–D1	5-1/4	5-1/8	5	4-15/16	15-1/2
D1–D2	11	10-7/8	10-3/4	10-11/16	32-3/4
D2–D3	5-7/8	5-13/16	5-5/8	5-9/16	17-1/4
D3–D4	8-3/4	8-5/8	8-1/2	8-7/16	25-7/8
D4–D5, D6, etc.	8-3/4	8-5/8	8-1/2	8-7/16	25-7/8

Contact Leonard Shick WB3AYW at 2631 Hershey Rd., Erie PA 16509. Please enclose an SASE. *The author thanks WA3ANA for his assistance in preparing this article and building the prototype, WB3JDI for VSWR and gain tests at the 1991 Field Day site, and K3VLQ and all the others who assisted with the tests.*

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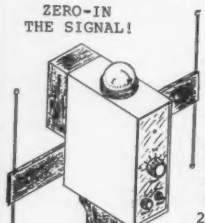
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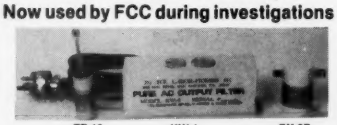
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Computerized Tuning for Ramsey Receiver Kits

It doesn't have to be expensive.

by Mike Gray N8KDD

Computer controlled tuning is generally considered the domain of only very expensive receivers. It doesn't have to be that way. This project will show you how to convert an inexpensive receiver kit from a manually tuned radio to a scanning receiver with 10 memory locations.

Receiver kits from Ramsey Electronics are tuned using a varactor diode. A bias voltage is applied to the diode, changing circuit capacitance as a function of the bias voltage. The capacitance is not linear with respect to the voltage, so a little slug tweaking is required to optimize the resolution for the band segment you are interested in. The tuning potentiometers provided with the kits are of high quality, but because they are linear the tuning resolution is reduced at low voltage. In other words, you can't expect as much selectivity when the bias voltage is low. This is not really a problem, and it isn't evident until you find that you have been turning the knob a little too fast and missing some active frequencies. A large diameter tuning knob will make an improvement.

These receivers are an excellent buy, and they perform very well. You can do a lot of experimentation with them without fear of creating a smoldering pile on the bench.

Using these receivers is a lot more fun when a computer does the work. Because computers are digital and the radio kits are analog, a digital-to-analog interface is required. The computer and interface do the same job as the tuning potentiometer, and allow automated control and scanning, too. Computerized tuning allows you to return to a particular frequency easily and accurately. Although absolute frequency cannot be determined without a frequency counter, a very close approximation can be made just by listening for scheduled nets. When you have a couple of absolute frequencies assigned to channels, you can use them as landmarks for unknown frequencies. A frequency counter is not necessary. Ramsey Electronics includes tuning suggestions in the kit documentation.

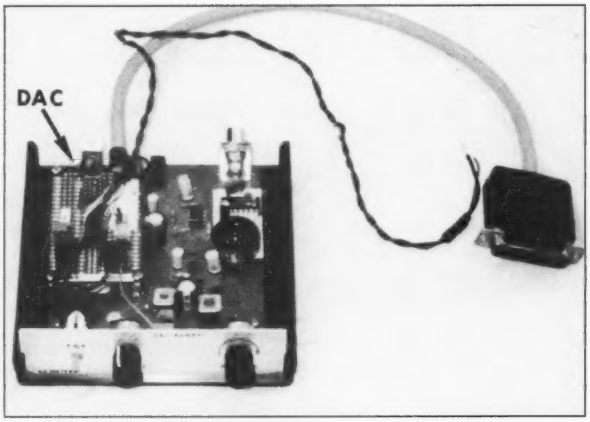

Photo A. Modified receiver (prototype).

Digital-to-Analog Converter (DAC)

The DAC reads 8 bits of data from the computer, then converts them to counts which represent some fraction of the reference voltage applied to the DAC. Two hundred fifty-five counts is equal to 5 volts. An LM10CN op amp is used to buffer the output from the DAC and double the DAC output voltage.

Some of the features of the DAC chip have been disabled because they are not required for this simple project. Only 10 wires connect the DAC assembly to the computer. Eight lines are for data, one is for DAC control, and one is ground reference.

The DAC and receiver together draw less than 25 mA, and both must be powered from a clean 12–13 volt source. The receiver isn't very particular about the supply voltage, but the DAC chip is. It must be powered by a supply which is at least 7 volts higher than its reference. You will have to remove the 9 volt battery holder from the receiver anyway, to make room for the DAC assembly.

Receiver Modification

This really couldn't be easier. Simply remove the tuning potentiometer and run a wire from the DAC assembly output to the center solder pad on the receiver board. Then run another wire from the grounded solder pad to ground on the DAC assembly. The figure shows an HR-4 40 meter receiver. UHF/VHF kits will be similar.

Connect a clean 12 volt (nominal) power supply or battery in place of the 9 volt battery on the receiver board. Make sure the polarity is right. I can't tell you what will happen if it's wrong, but it can't be anything good.

Power for the DAC is taken from the center terminal of the power switch on the receiver kit. Just connect a wire from the top side of the switch to the DAC. That way, the front panel switch controls both boards.

These receivers are very sensitive. You must use a coaxial feedline, and locate the antenna at least 12 feet away from the computer, otherwise you may be listening to computer generated noise. The amplitude of the noise depends upon the receiver frequency, and the clock rate of your computer. A 7 MHz computer will wreak havoc with a 40 meter receiver if the antenna is too close.

I had added an amplifier and a Radio Shack piezo-electric audio transducer to my receiver during the course of a previous experiment. The assembly is located near the antenna connector. It's a big improvement over an earphone, and it sounds pretty good, too.

DAC Construction

The entire assembly could be built on a Radio Shack plated PC board. Photo A shows a switch in my prototype which is not required in the final version. The switch allows the gain of the op amp to be fixed or variable.

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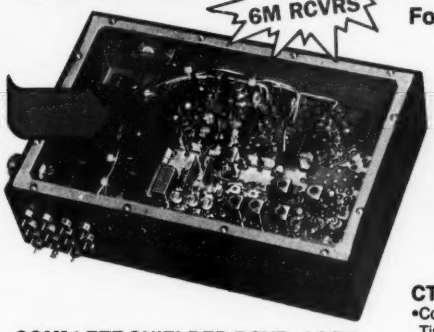

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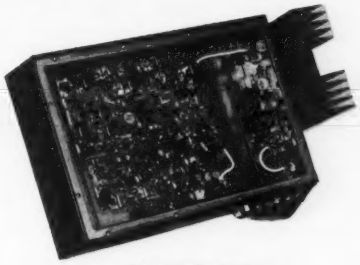

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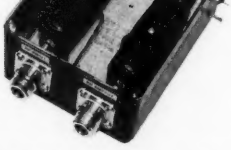

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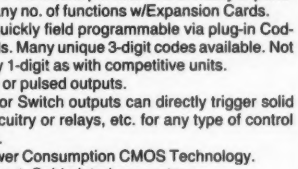

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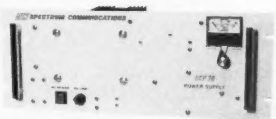

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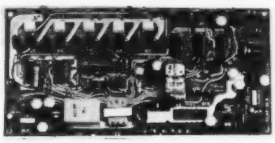

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We need adjustable gain, so the switch is not included in the schematic.

To attach the DAC board to the receiver board, screw a threaded spacer to each corner of the DAC board. Then apply a little epoxy to the bottom of each spacer and set the assembly on the receiver board.

You can use ribbon or bundled cable to connect the DAC to the 25-in. connector. A complete printer cable can be bought for about $8 from computer discount houses. Buying a printer cable might be cheaper than buying the connector and wire separately. Just cut the printer connector off, and using an ohmmeter, find the wires for pins 1–9 and 25.

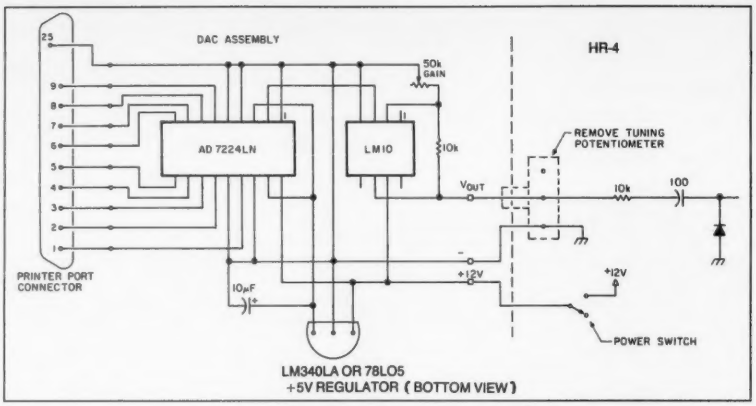

Figure 1. Schematic of the computer interface.

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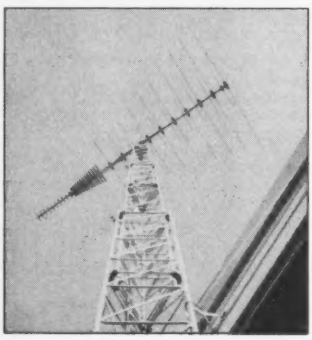

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Software

The computer controls the WR line of the DAC chip, and supplies the 8-bit data word, which the chip converts to a voltage. The program must toggle the WR line, and send 8 bits of data to the DAC. The DAC chip will latch the output voltage at the most recent level, until instructed to change it or power is lost.

The program listing in the sidebar is the minimum required to produce an output voltage from the DAC. The listing prompts you to enter the desired output value in counts.

After you finish assembly of the digital-to-analog converter, run the program and enter 255 counts. Turn the potentiometer until the voltage at pin 6 of the LM10 is 10 volts.

The address of the printer port of most computers is 888. If the circuit does not respond, change address 888 to 956, and change address 890 to 958.

Find an active frequency by entering a value from zero to 255 when the program prompts you for it. Each time you find activity, write down the D/A counts so that you can return to that frequency just by entering the number. The program kernel shown in the sidebar is intended for experimentation. In order to realize the advantages of computer tuning, a more sophisticated program is in order.

My program is much too long to list completely here. You can write your own program or download mine from the *73* BBS at (603) 525–4438. The name of the program is DAC-TUNE.ZIP, and it will run on PC compatibles with CGA graphics. I can also supply the program on a diskette for $6.

The DAC-TUNE program can scan the entire band (global search), or station presets. When you hit any key, the program stops scanning and executes the command associated with that key. Manual tuning is accomplished with the left and right arrow keys. When you find an active frequency, you can assign it to a channel. You can return to any channel simply by entering the channel number. Station presets, frequencies, and screen colors are saved in a file called SETUP when you terminate the program. These are recalled automatically the next time you start the program. The program operation is self-explanatory.

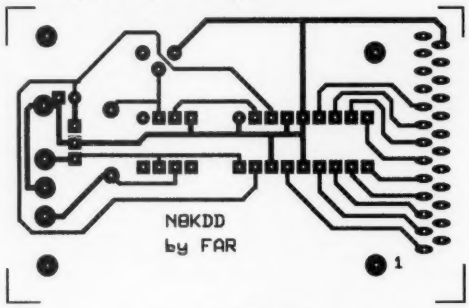

Figure 2. PC board.

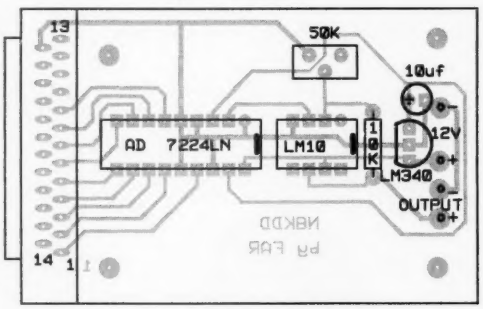

Figure 3. Parts layout.

The DAC chip is relatively new and can be purchased only in lots of 10 or more from the distributor. I can offer kits which include a printed circuit board, DAC-TUNE software, and components. I have not included a printer cable, because cables are often available cheap or free locally. A kit costs $30, which includes shipping and tax. If you just want the 7224 DAC, it's available for $10. The blank PC board is available for $6.

The receiver kits are available from *Ramsey Electronics, Inc., 793 Canning Parkway, Victor NY 14564.* 73

Contact Mike Gray N8KDD at 465 W. Maple Road, Milford, MI 48381.

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73 Review *by Gordon West WB6NOA*

ICOM IC-2SRA 2 Meter HT and Scanner

A full-feature 2 meter handheld with a separate wideband receiver.

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Price Class: $600

ICOM's new IC-2SRA should really get the attention of the avid ham and dedicated scanner enthusiast. Not only is it a 2 meter hand-held,it also has a built-in wideband scanner receiver.

Two Antennas???

The IC-2SRA looks exactly like the popular ICOM dual-band 2 meter/440 MHz IC-W2A. The buttons, oval magnified LCD screen, and top knob placement are identical. Even the little red power-on button is the same as the ICOM IC-W2A.

But there IS one thing that immediately sets the two units apart when you put them side by side —the IC-2SRA boasts two antennas coming out of the top. That's right, folks—antennas in stereo.

On the first look, you might think someone is teasing you by sticking an antenna speaker/microphone jack on the top of the unit. In fact, when you take a close look at the top of the 2 meter scanner, you'll see that the two jacks are absolutely identical—the left jack for the speaker/mike, and the right jack for the supplied wideband rubber ducky. No BNC jack—no TNC jack—simply an earphone-type jack that the wideband scanning antenna plugs into. It seems to make a good connection, but nonetheless, an earphone jack for an antenna connection?

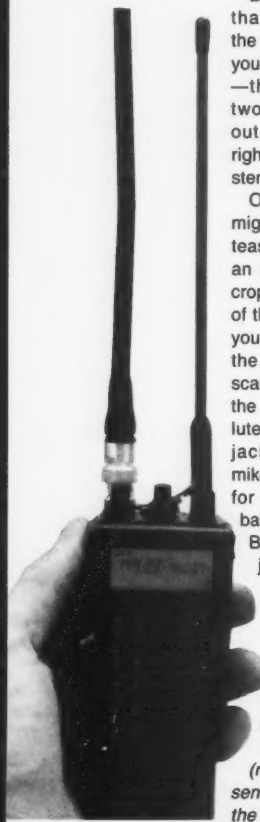


Photo B. Antennas in stereo! We found that the wideband antenna for scanning (right) was not quite as sensitive on 2 meters as the 2 meter ducky (left).

Photo A. The IC-2SRA, showing the 2 meter readout (left) and the scanner frequency readout (right).

The 2 meter side of the ICOM IC-2SRA hand-held transceiver/scanner seems identical to the IC-W2A receiver. The 2 meter receiver tunes from 136.000 MHz to 174.000 MHz, and transmits from 140.000 MHz to 149.995 MHz. We measured in-band receive sensitivity at 0.095 μV for 12 dB SINAD, and 30 kHz selectivity at −60 dB. The 2 meter receiver gave us the good performance we have always found with ICOM hand-held transceivers, in both single-band and dual-band models.

We tested the 2 meter receiver on an outside antenna. There were absolutely no surprises when it came to good rejection to out-of-band paging transmitters, local weather stations, and numerous other high-band signals blanketing my local QTH. On the same outside antenna, some other brand HTs have not fared as well—but, as usual, the 2 meter receiver was nice and tight in a heavy RF area.

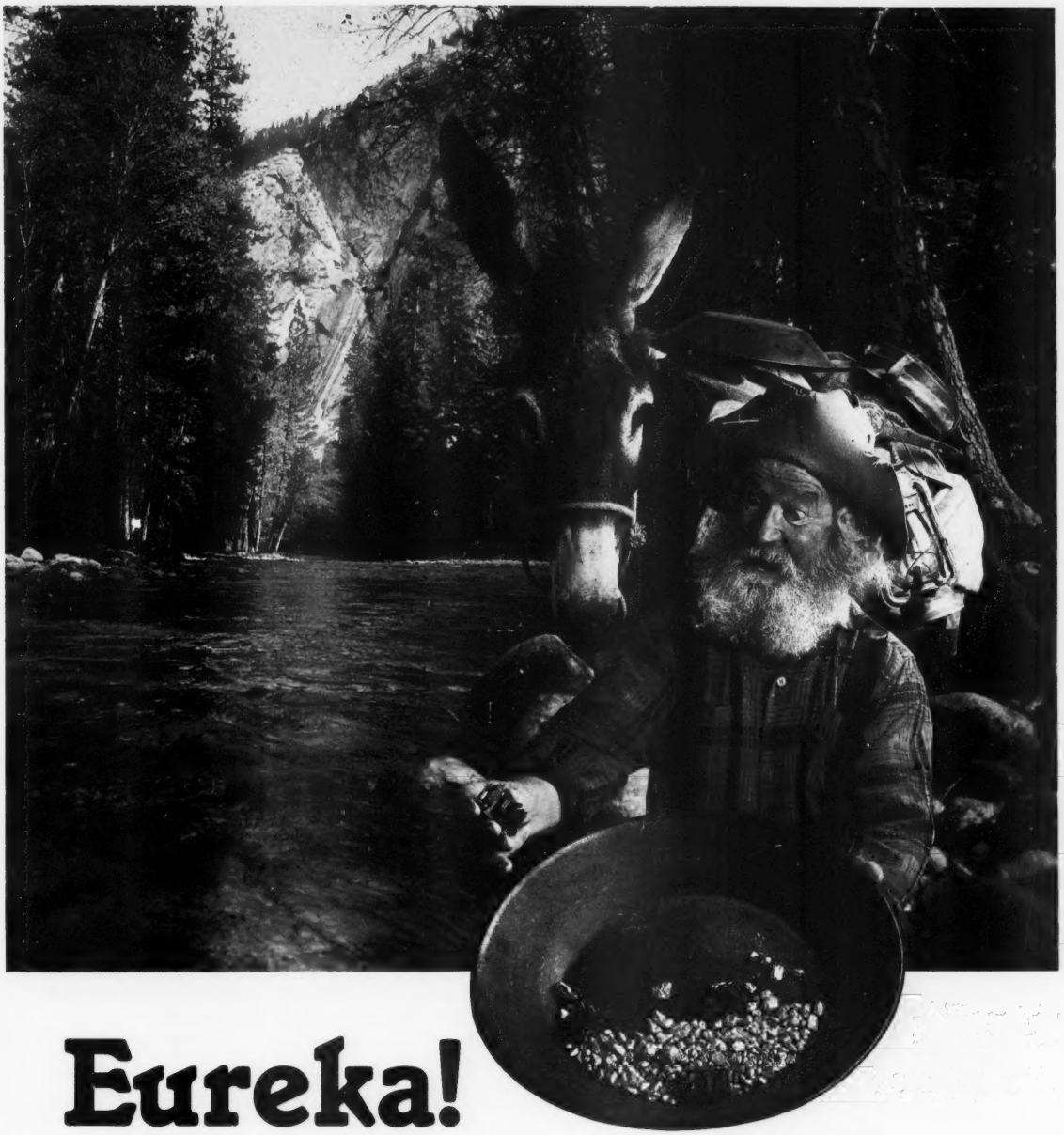
The 2 meter transmitter pops on at 140.000 MHz and cycles off at 149.995 MHz. This is good news for those of you in the United States Coast Guard Auxiliary, Civil Air Patrol, or MARS. As soon as you unpack the unit you are on the air on those government frequencies, if you've got the proper license.

Push-Button Programming

Four levels of power output are available from the push buttons. (Table 1 shows what we measured.) When you first set up the programming of your handheld, you may dial in exactly how low you want your low-power output to be. I chose the lowest setting—Low 1—because this only draws 478 mA on my high-power battery pack, as opposed to a whopping 1.34 amps on high power.

The 2 meter side of this transceiver/scanner features all the functions and sub-functions found with a sophisticated handheld. It will take you some time to learn all of the programming steps to

*Photo C. The 440 MHz version of the transceiver/scanner. Remember, it is **NOT** a dual-band, only dual-receive.*



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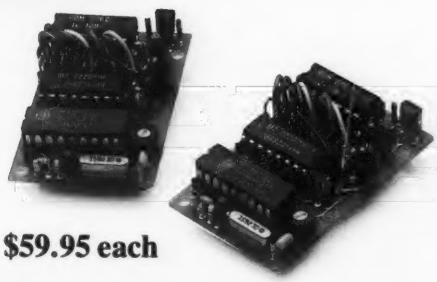

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Table 1. Available power output from push-button selections.

Receive limits: 25.000 MHz through 950.000 MHz
No locked-out band segments; few birdies
Modes: AM, FM, wideband FM
Average NBFM sensitivity throughout band: 0.32 µV for 12dB SINAD
Receiver type: Triple-conversion superhet
Tuning steps: 5, 10, 12.5, 15, 20, 25, 30, 50, 100 kHz (VHF band);
10, 12.5, 20, 25, 30, 50, 100 kHz (UHF and 800 MHz–950 MHz)

Table 2. Scanner/receiver features.

set in your favorite repeater and simplex frequencies in the 30 memory channels, plus the single call channel and two-frequency band edge channels.

Of course, what's a 2 meter transceiver without a clock? That same clock that can turn your unit on can also shut it off. In fact, the clock button is right next to the "enter" button, so you might be seeing the clock come up a lot more often than you want to until you get more precise at poking away at the closely-spaced rubber keypads.

Built-In Scanner

Early press releases indicate that this single-band 2 meter or 440 handheld contains a built-in "wideband receiver." What they are saying is that the single-band 2 meter or the single-band 440 handheld has a built-in, wideband, multimode, 60-memory-channel scanner. (Table 2 lists what we found in the separate built-in scanner/receiver.)

The wideband scanner/receiver is not part part of the main transceiver receiver section. Rather, it's absolutely separate, with its own right-hand LCD readout, antenna port, volume and squelch knob

CH	VIDEO	AUDIO
2	55.25	59.75
3	61.25	65.75
4	67.25	71.75
5	77.25	81.75
6	83.25	87.75
7	175.25	179.75
8	181.25	185.75
9	187.25	191.75
10	193.25	197.75
11	199.25	203.75
12	205.25	209.75
13	211.25	215.75

Table 3. TV channels 2–13 audio frequency assignments tuned "WFM" mode on the ICOM IC-2SRA scanner.

squelch knob, and automatic turn-off when you are actually transmitting on the 2 meter band.

This prevents feedback, desense, and potential damage if you're receiving on the same frequency as your transceiver is transmitting. We made that test, and as soon as we hit the PTT the receiver simply blanked out.

And speaking of blanking out—when you begin to program the wideband receiver, as soon as you hit the enter button, the screen goes blank. Do not worry! Start punching in numbers, and the screen jumps to life. This is different from what occurs on the 2 meter side of the radio. On 2 meters there are always a couple of leading numbers to let you know where you are, but on the receive-only side of this transceiver the screen blanks out to allow you to punch in anything from 25 to 950 MHz.

Use the AM mode for tuning in the aeronautical band, the 27 MHz band, or some aeronautical military frequencies in the 200–300 MHz band.

Use the FM mode to listen to regular two-way radio communications. For listening to some pop music on the FM music band, use the WFM (wideband FM) mode. It's easy to select the mode—simply press a single mode key. Be sure to add a leading zero to any direct-dial frequency below 100 MHz. If you don't, you won't hear your popular FM music station at 88.5, because your radio is at 885 MHz!

In the wideband FM mode, you can easily tune into all television audio channels. It comes out crystal clear (except for a birdie on 71.75 MHz, TV audio channel 4, which ICOM indicates they will try and cure), and has a lot more fidelity than trying to tune into a ball game on an old-fashioned AM portable radio. Spend a few minutes, and store your local TV audio channels in the memory for quick retrieval. You can always search out the audio by setting the squelch, and then electronically scanning up. Of course, you can do this at the same time as you are working on the 2 meter side of your transceiver. (See Table 3.)

Unfortunately, the receiver does not go all the way down to shortwave or AM broadcast band frequencies. The lowest you can tune is 25 MHz, and with that little tiny, skinny, rubber duck antenna, any signal below 40 MHz better be real strong.

There will be some ICOM products coming down the line, specifically for tuning in the shortwave bands, but this one won't go below 25 MHz.

To increase your scanner reception, solder up a miniature plug with micro-sized coaxial cable or a good shielded short piece of audio cable. Terminate that to a BNC jack, and this would allow you to plug into a regular outside antenna for improved reception. But a word of caution: The scanner antenna jack is little more than an audio plug receptacle, so don't even consider running a regular piece of RG58AU to it. It could cause the jack to fail.

Another word of caution: The engineers at ICOM recommended at least five feet separation between any external antenna hooked into the antenna jack from a regular transmitting VHF or UHF antenna. I tried this set-up, and didn't blow the receiver—but be careful. With any scanner on an outside antenna, permanent front-end damage might occur if your scanner antenna gets right next to a high-power transmitting antenna.

As for selectivity and intermod rejection, the triple conversion receiver did a good job of canceling out the stuff not on frequency.

I would have preferred a BNC or TNC type connector for the scanner antenna, and it would also have been nice to give you a little bit more "finger room" between the second antenna and the main tuning knob. Also, don't be surprised that the plug-in charger that comes with this unit features yet another design not found on those octopus charging plugs with multiple adapters. But good news—if you already own some ICOM products, the battery packs may be interchangeable, and this includes the drop-in charger, too.

If you are into both 2 meter and 440 MHz (separate units), and also want a built-in scanner, do consider this new offering from ICOM. The scanner capabilities were just as good as with a regular-sized pocket scanner, and the audio a whole lot better from the ICOM communications-style speaker. Best of all, it's one radio with both a built-in ham band and a scanner.

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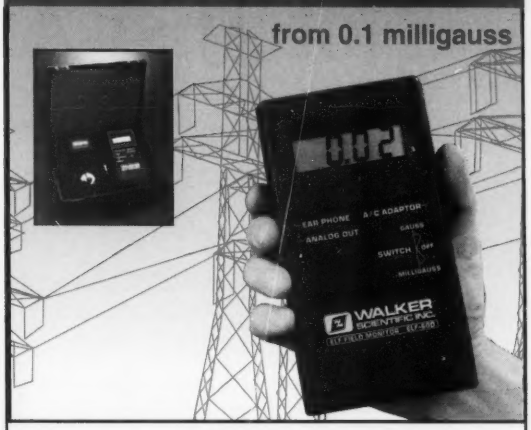

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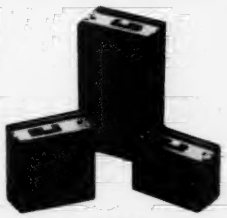

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Not Just Another Island

Weekend DXpedition activates the Walrus Islands.

by Bob King NL7KH

The Walrus Islands are a group of five small islands in the Bering Sea, tucked in along the southwestern shoreline of mainland Alaska. These islands are uninhabited for most of the year, but in the summer their population swells with hundreds of thousands of seabirds—puffins, kittiwakes, auklets and murres.

Thousands of walrus also make the islands their summer home. Male walrus only, though. While the females take care of their young farther north, the men haul out on Round Island, feasting on clams and tanning their bodies on the gravel beaches. It's the ideal bachelor pad, if you happen to be a one-ton pinniped!

Human visitors are rare. Adventuresome wildlife enthusiasts who can afford the trip will venture to the islands to view the walrus and the spectacle of thousands of cliff-dwelling birds. Commercial fishermen are also familiar with the nearby waters, where they cast their nets for herring, salmon, halibut and sole. But before this June, the Walrus Islands have been unknown to the ranks of amateur radio.

Photo A. The KL7N camp on remote Crooked Island, in the Walrus Island chain.

An Island "Vacation"?

"Back in 1988, Chod Harris VP2ML wrote a column for *73* (see DX, July 1988, p. 87) about a group called Islands on the Air," said Scott Diseth KL7N. "In it he explained what IOTA was all about and what islands qualified for the program. He mentioned that Alaska has 24 potential credits, 14 of which have been on the air. Anyone for a DXpedition to Walrus Island this summer?" he asked, kind of tongue-in-cheek.

IOTA members, or "island chasers," as they're known, collect contacts from as many islands or island groups around the world as possible. Many islands, like Hawaii, New Zealand and the Bahamas, are relatively easy catches, but the prospect of a new group like the Walrus Islands was tempting. *[Ed. Note: The IOTA group meets on 14.260 MHz at 1300 UTC Saturdays, 21.260 MHz at 1400 UTC Sundays and on 28.460 MHz just about anytime. Also a list of potential island credits "The IOTA Directory," is available to U.S. residents for $4 ppd. from* The DX Bulletin, *Box 50, Fulton CA 95439.]* Scott, a resident of Dillingham, Alaska, just 60 miles from the island group, decided it was time to take up the challenge. "None of us are IOTA members, but it seemed obvious to me that the Walrus Islands were a rare one, something that people wanted, and it was right in our back yard," he said. "It was kind of a lark, but we were the only ones qualified to activate the islands." Joining KL7N in the expedition were Les Robinson KL7KN, Mike Megli AL7KA and Bob King NL7KH, all residents of Dillingham.

Getting There

Even though the islands are not far away, getting to them was an expedition in itself. Round Island, home to most of the walrus, is a state game sanctuary and access is restricted, so the expedition chose Crooked Island, the second largest island in the chain.

Crooked Island, however, is accessible only by boat or floatplane. Fortunately, the owner of Yute Air Alaska, a Dillingham-based air taxi,

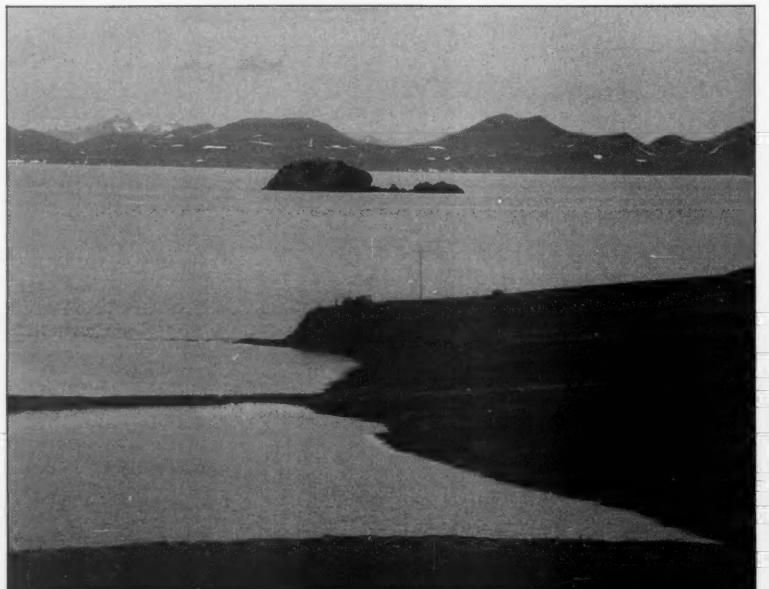

Photo B. The KL7N site and antenna farm on Crooked Island.

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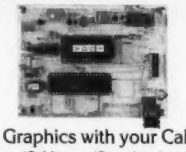

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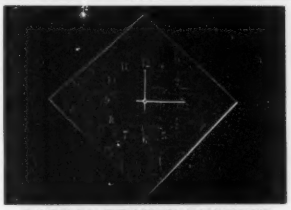

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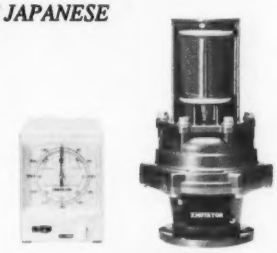

747SRX

1200FXX

Model/ Specs	Emoto 105TSX	Emoto 747SRX	Emoto 1105MSX	Emoto 1200FXX	Emoto 1300MSAX	Emoto 1800FSX	Telex HamIV	Telex T2X
Rotate Torque F/#	37	50	57	143	215	287	67	83
Gd² KgM² Ant Inertia	100	400	700	1000	1800	3000	N/A	N/A
Brk/Static Torque F/#	215	502	717	1290	1792	2150	417	750
Wind Load In Tower Ft²	11	22	27	27	33	36	15	20
Mast mount	5	9	12	12	15	16	7.5	10
Rotating speed 360°	55	35	65	40	77	80	60	60
Power 120V 60Hz	70VA	70VA	70VA	90VA	120VA	150VA	26V AC	26V AC
Mast Dia.	1.2-2.4 in	1.6-2.4 in	1.6-2.4 in	1.6-2.4 in	2.4-3.1 in	3.5-5.5 in	2 in	2 in
Vertical max load #	660	1100	880	1760	1760	2200	400	800
Rotor wt/#	7.5	9	11	11	13	39.5	14	18

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is an active ham himself. Will Johnson WA0LKT and one of his pilots, Steve Huddleston KB5GAH, volunteered to help with the transportation. To expedite matters, Steve ferried planeloads of equipment to a beach halfway to the islands, and from there it was transferred to Will and his Cessna 206 on amphibious floats.

It took three trips on each leg. Some of the larger equipment, including a 35-foot crank-up tower and the disassembled antennas, had to be strapped to the plane's floats.

Scott rode over on the first flight to select the site and set up camp. "On the first flight, we took the antennas, the tower, and enough gear for me to survive in case nobody else made it," he said. "You never know what's going to happen."

Fortunately, the weather cooperated with the DXpedition. The skies were sunny and the winds were calm as Will shuttled back and forth with equipment and Scott began to set up the tents and a small farm of antennas.

The radio tent held a Kenwood TS-440 and a Heath SB-200 amplifier. Since the linear drew almost all the current of the generator, the transceiver was run off batteries which were recharged at night. The signal was fed into a Hy-Gain TH-3-JR yagi atop a Tri-Ex 35-foot crank-up tower. A home-brew phased vertical was used as a backup. Having a backup became important as soon as Murphy made his first appearance on the island: Inevitably, the one box that got left back in the hangar 60 miles away contained all the group's tools.

"Yeah, things went pretty smooth, except for forgetting our tools and extension cords," Scott later joked. "But, using some ingenuity, we rigged up a phased vertical system with Mike's leatherman tool and Les's Swiss Army knife. That wasn't enough to put the yagi together, but it worked for the vertical. So score another one for the Swiss Army knife!"

Photo C. Members of the Walrus Island group (l. to r.): Scott Diseth KL7N, Les Robinson KL7KN, Bob King NL7KH and Mike Megli AL7KA.

Photo D. Scott KL7N logs contacts while Les KL7KN works the pile-ups.

On the Air

We were still struggling to assemble the antenna, and running out of options on our Swiss Army knife to do it with, when somebody asked, "What time is it?"

The sun was still high in the Alaskan evening sky, but it was already ten minutes past nine. Ten minutes late for our first sked.

Hurriedly, we hooked the rig up to the half-erected vertical just to see if anybody was waiting. Scott whirled the dial on his TS-440 to 14.260 and, sure enough, there was already a pile-up trying to contact KL7N, portable Walrus Island.

With the phased vertical directed north and the rig running barefoot due to the lack of extension cords, KL7N activated the Walrus Island group, designated by IOTA as NA-121, at 0528Z on June 2, 1990.

The first contact came off the side of the antenna, from "Doc" Khalsa KD7SO, in Eugene, Oregon. Doc is IOTA's point man on the West Coast and had helped Scott arrange publicity about the expedition. He had been among those calling for KL7N. In fact, when the group missed its 9 p.m. sked, he had begun to get worried.

"When we were late, Doc called my wife Vickie to find out what had happened to us," Scott recalled. "He was on the phone at 0515 and Vickie assured him that we were out there."

After logging his first 59 report, Scott worked a few more stateside contacts and, as luck would have it, Will's Cessna unexpectedly buzzed the camp to announce the belated arrival of the toolbox. The plane gingerly taxied up to the rocky shoreline. The yagi was quickly assembled and NA-121 was in business.

Over the next day and a half, KL7N logged 464 contacts in 42 countries and most of the United States. Most of the calls came on the IOTA frequency of 14.260, but a few contacts were also made on the 15 and 40 meter bands.

Europeans are the most eager island chasers by far. Contacts were quickly made in England, France, Germany and Italy, throughout Scandinavia, and in Spain and Portugal. Signals flowed freely over the now-crumbled Iron Curtain from East Germany, Poland and Czechoslovakia. Latvian and Estonian hams lined up with Russians to swap reports with KL7N, but it was a most orderly pile-up.

Johnnie Varetto I1HYW provided net control on the continent and ran a tight show, which was appreciated back on the island. "It was kind of a free-for-all with the Americans," Scott said. "It seems like IOTA is a

lot more popular with the Europeans. They're a lot more organized."

While members of the KL7N group took turns making contacts, others hiked around the island, beachcombed, and even tasted herring roe on kelp—a Japanese delicacy which is collected by commercial fishermen on nearby beaches. On Saturday, Will shuttled some of the expedition's families over for a visit. Scott's son Alex celebrated his sixth birthday playing along the shoreline of Crooked Island while his father worked DX, including a call from his father-in-law, Walt Wilson K8AEM, in Marshall, Michigan.

"We cleared the frequency for that," said Scott. "That was the biggest thing that ever happened to Walt."

Actually, Walt has been an invaluable friend of amateur radio in Dillingham. Over the years he has helped get gear for just about every ham in the isolated fishing community. Having a stateside connection is a necessity for hams in remote places like Dillingham, where the nearest Radio Shack is 350 miles away.

Walt also kept tabs on the expedition throughout the weekend. Since almost all the hams in Dillingham were on the island, Scott's wife Vickie had to call her father in Michigan to make sure the group had arrived safely. Mike was able to finally reach home through the Dillingham repeater, but it took an evening climb up a thousand-foot peak, and a ⅝-wave whip on his handie-talkie, to raise the carrier.

Next Time...

Back home now, Scott has been busy verifying the QSL cards he has received not only from hams but from the many SWLers who monitored the expedition.

Despite the complicated logistics and occasional mis-cues, Scott credited the relative ease of the undertaking to past Field Day work. "Without the Field Day experience, we wouldn't have been able to put it together," he said.

"But, I think everybody is Field Day'ed out. I doubt if the Dillingham Club will be on the air this year. Even a weekend DXpedition is kind of a Field Day to the extreme."

But would he reactivate the island again? "Yeah, I think I would in a couple of years," said Scott. "I don't think we worked everybody. There are 2,000 members of IOTA, so it sounds like we only worked a quarter of them. There must be others out there that still need Walrus Island.

And I won't forget my tools," Scott added with a laugh. "Actually, I would have spread my tools out. I wouldn't have had them all in one box."

Scott also said that next time he would try to give IOTA members more advance notice. The KL7N group went out with just two weeks notice. But longer lead time is not always possible in the Bering Sea.

"The problem with those islands is the weather. You can't stick your necks out two months in advance and say you're going to go, because you can't even be sure you're going to make it. 73

Number 14 on your Feedback card

HAM HELP

Your Bulletin Board

We are happy to provide Ham Help listings free on a space available basis. To make our job easier and to ensure that your listing is correct, please type or print your request clearly, double spaced, on a full (8½" x 11") sheet of paper. You may also upload a listing as E-mail to Sysop to the 73 BBS /73 MAG Message Area #1. (2400 baud, 8 data bits, no parity, 1 stop bit. (603) 525–4438). Use upper- and lower-case letters where appropriate. Also, print numbers carefully—a 1, for example, can be misread as the letters l or i, or even the number 7. Specifically mention that your message is for the Ham Help Column. Please remember to acknowledge responses to your requests. Thank you for your cooperation.

Wanted: A copy of the manual for Dentron 160-10L with 811a tube, or info on converting 160-10L/572B to 811A. I will pay copy cost and shipping. Ship to *NP4XB/4* or call *(407) 273–3335* from 9 to 5 EST.

I have a Side Band Engineers (SBE)-33. I would like a copy of the schematic and the operating manual. I will be happy to pay postage and copying costs. Thank you. *Joel Kaplan WA7ERH, 1425 E. Ocotillo Rd. #2, Phoenix AZ 85016. (602) 277–2832.*

Wanted by handi-ham: Older HF SSB rig or 2 meter FM equipment dead or alive, inexpensive to repair. Please write to *N3IMJ, 257 Sebring Ave., Pittsburgh PA 15216.*

Wanted: Operating manuals and schematics for Hallicrafter SX-42 (Skyrider Panoramic) 6-band general coverage receiver and Johnson Viking Messenger I (5 channel "white face") 11-meter transceiver. Originals or copies are fine. I will gladly pay duplicating costs and postage. *Kelly Andrews, 8608 Timberwind Dr., Raleigh NC 27615. Day phone (919) 870–0315; evening phone (919) 870–6923.*

Needed: Service and/or operating manual for Hallicrafter's SX-99. I will pay for original or copy. *Luther Hollums N4KTC, 15103 Mahogany Dr., Boynton Beach FL 33436.*

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Notes from FN42

I have received a request for information about Romania, but I have none. Do any of you have news you could send me?

This month's column includes excerpts from five letters from the USSR, which certainly shows the opening of communications to the rest of the world from there.

Dave Horsfall submits his first offering from the land "Down Under." Much food for thought.

I would like to add my wishes to all for the religious season that is upon us, with peace and prosperity for all. Happy Holidays!

And last but almost foremost, I wish to thank Rod Hallen for his faithful reporting from Kenya during the past years. His news is always timely and informative. Best wishes in his move, and I certainly hope that he is able to acquire a license to operate in Pakistan. I am printing a letter from him in the column. Rod, I will certainly be glad to continue you as the new Hambassador to Pakistan. Think it over.—Arnie

N1BAC Roundup

USSR *From Vlad Zaytsev UA4FDS:* In April 1991 Paul UA4FEG and I began planning our second DXpedition within a year. We had operated from UH8W, UH8Y, and UI8U in early 1991 as UA4FEG/. . .and UA4FDS/. . . . We gave serious thought to our next spot. We contacted UZ4FWD, who had been to Asia in 1989, in hopes of obtaining information on making arrangements to get to Uzbek and Turkoman. They gave us a description and a few words about that particular operation. We then prepared our equipment, which included: a new model radio, two amplifiers with modern tubes, a folding 10 meter tower, a 3-band home-brew yagi, cables, guy wires, autotransformer, etc., with a total weight of about 300 kg.

We hope to get to Asia in October for two weeks, operating CW and SSB from those oblasts on all bands except WARC. We hope that conditions will be good and we will get through to all the world.

Please QSL to UA4FDS—Vlad Zaytsev, P.O. Box 555, Penza 440061 USSR (CCCP), or UA4FEG—Paul Bogachev, P.O. Box 222, Penza 440011 USSR (CCCP). We are also good in the *1991 Call Book*. Please QSL with a self-addressed-envelope (SAE) and IRCs or US$.

From Yuri Funkner UL7LS: QSL information for RF6Q/UL7LS is Yuri V. Funkner, P.O. Box 1 Frunze 459411, Ordzhonikidzevskiy rayon, Kustanayskaya oblast, Kazakh SSR USSR.

From Andrey V. Pervacov UA9XC: If you worked any stations from UA9X (UZ9X), Komi, SSR, U-obl:090 from 19 to 24 August 1991; or 4K3, Vaygach Isl., U-obl:114 from 20 August to 2 September 1991, or from Amderma, QSL direct or via P.O. Box 1247, 167001 Syktyvkar, USSR with an SASE. *[Andrey is the president of the Friends Radio Society.]*

From Alex Ulyanich RB5IJ: A new, comprehensive, English-language publication, *Soviet Ham Press Digest*, became available during the summer of 1991. The *Digest*, or *SHPD*, covers all aspects of the exciting world of Soviet amateur radio, and is aimed at amateurs around the world. Topics include ham life in the USSR, DXpeditions, clubs, awards, QSL information, contesting, equipment, and more.

SHPD, edited by Alex Ulyanich, is published by the Prometheus Amateur Association (PAA) of the Ukraine. Letters, articles, pictures, etc. should be submitted directly to the editor.

Subscriptions are available for US$12 and your callsign, name, and address, from PAA, c/o George Yankopolus NA3O, 13 Glen Meadow Drive, Glen Mills PA 19342. Up-to-the-minute member and DXpedition lists are available for IRCs/SASE from PAA, Box 195, 340000 USSR, or to NA3O. It is suggested that applications for membership (one-year US$10 and life US$50), award programs, and fees go to NA3O. *[We received a copy of the first edition, No. 1, August 1991, from Alex. It is 4 pages, 7 1/2 x 11 inches, translated from Russian to English, and appears to be very well done. The PAA also has an award program. I will upload the info to the 73 BBS under "Prometheus Award Program."—Arnie]*

From Sushkov Valery UA3GPA: Sushkov says that he has all addresses of the radioamateurs in the USSR and information about special callsigns, memorial calls, DXpeditions, and other information. If you are having trouble sending or obtaining QSLs, you may want to use his "Express QSL Service". Please SASE for more information to: Sushkov Valery, P.O. Box 3, Lipetsk, USSR, 398000.

AUSTRALIA

David Horsfall VK2KFU
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Wahroonga NSW 2076QL
Australia
PACKET:
VK2KFU@VK2RWI.NSW.AUS.OC
INTERNET: dave@ips.OZ.AU

Hello from "down-under," or, as they say, "G'day." I'll be bringing you news of happenings in Australia, and I hope I can do as good a job as the late Ken Gott. By the way, it's nice to see that the USA has finally created a code-free licence—Australia has had one for almost forty years. Naturally the same gloom-and-doom predictions were made, and again when the Novice licence was introduced in the seventies, and again when Novices gained 2m FM privileges recently. . . . Amateurs certainly seem to be a gloomy lot!

Speaking of code-free licences, the debate is raging once again on the removal of the CW requirement for access to HF bands. The idea is to replace it with extra theory (packet radio perhaps?). Funny how it's mostly the code-free licence (6m and above) that seems to agitating for this! The packet radio system was full of messages on this subject. A lot of people appear to be unaware of the international radio regulations in this respect, although it won't be long before Morse code ceases to be used by the Maritime Service. Whither CW then?

Another battle being fought is the perennial packet protocol wars, this time ROSE vs. NET/ROM. Although NET/ROM is not permitted at the data link layer (due to what some would regard as restrictive Government regulations), it is allowable at level three, and appears poised to defeat ROSE. Given a country the size of Australia where nodes come and go (especially when they get stolen!), the dynamic routing capabilities of NET/ROM makes a lot of sense. As is becoming usual in amateur radio, there is a lot of in-fighting going on, and by the time this appears in print there may be some developments. Indeed, there are rumours that NET/ROM at level two will eventually be allowed, and some hardy souls are already using it. . . . The general feeling is that the government should not ordain how packets travel from point A to point B.

The Wireless Institute of Australia (WIA) has now become the sole supplier of examination papers to accredited examiners around the country. Previously, these examiners composed their own papers and submitted them for approval to the Department of Transportation and Communications (DoTC). This system was beset with various difficulties, with many unsuitable examination papers being rejected, and eventually the DoTC invited the WIA to become the sole supplier. Naturally, this upset a number of people, with all sorts of ludicrous claims being made, such as that the WIA was trying to make money from the system! Hands up, those VEs who are making money from examinations. . . . This will take effect from next year, and is being phased in from October. It remains to be seen whether it works or not, but the "debate," if that is not too strong a word, is raging.

Cheers for now.

BRAZIL

Carlos Vianna Carneiro PY1CC
Alfonso Pena, 49/701
20270 - Rio de Janeiro
Brasil

Brazilian QSL Bureau Update! According to the Brazilian Radioamateur League's statutes, delivering QSLs for all associates is one of the league's responsibilities.

In Brazil, a country with continental dimensions, our League has as many branches as states, and now and then, as every other year a new Directory is elected, no one can help eventual misunderstandings and collapsing here and there, hitting points that ought never be touched.

Something like that has hit exactly such an important point: the delivery of QSLs to the DX Bureau suffered during the last year, and we had to put an end to this disaster!

Unfortunately, the words about this were spread everywhere, radioamateurs from Brazil and DX were having troubles with the movement of their QSLs.

Something had to be done. The present President and Vice President of Radioamateurs League in Brazil had a very serious meeting with the EBCT (Brazilian Post Office Enterprise) main authorities.

An agreement was settled granting LABRE special post taxes, 40% lower than usual, a guarantee to the perfect development of these invoices by the Brazilian Radioamateurs League, the real importance of radioamateur being recognized. And in very special deference to all radioamateurs, the EBCT is delivering, by its own, more than one ton of QSL cards still in Brazilia at that time, as a show of what all radioamateurs represent to worldwide communications.

The troubles are over. We congratulate both the EBCT Brazilian Post Office Enterprise and LABRE, Brazilian Radioamateurs League, for this agreement towards the development of friendship, culture, understanding, communication, and goodwill among people of the world.

And to our DX friends, this agreement is surely news, as many of you still need Brazilian QSLs for awards and files just as we too need the DX QSLs for our awards and files.

Ham Radio in a Marathon! It seems for the first time in the world, as far as we know, a radio amateur joined a Marathon, running more than 42 kilometers, handling and operating a VHF radio, tied to an HF radio through a repeater.

This past June, Sunday the 23rd, Paulo Roberto Domingos Sobrinho PY1ZT, operating with a special callsign of ZY1ZT, left the starting point at Leme Beach in Rio to run the International RIO Marathon, aiming at this "for the first time in the world" title!

Paulo used an Icom IC-2SAT linked to the LABRE's office through a VHF repeater on 147.300 MHz on a mountain near Niteroi City. PY1SCR operated the LABRE Kenwood TS-430S, handling calls to Paulo and trying to keep the battery usage down on the HT.

Even though many problems surfaced during the run (dead batteries and frayed mike cord, fixed with Paulo's teeth while still running), Paulo made 42 contacts on 2m, 40m, 20m, 15m, and 10m.

This year close to 3,000 athletes

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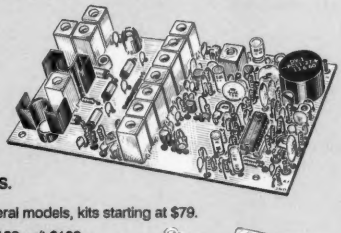

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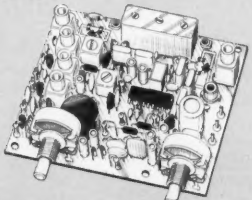

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- **R901 902-928MHz FM RCVR.** Triple-conversion, GaAs FET front end.
- **R76 ECONOMY FM RCVR** for 6M, 2M, 220MHz, w/o helical res. or afc. Kits $129.
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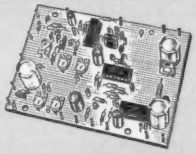

COR-3 REPEATER CONTROLLER kit. Features adjustable tail & time-out timers, solid-state relay, courtesy beep, and local speaker amplifier $49

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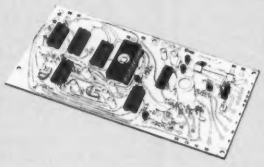
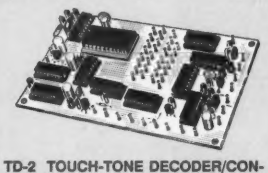


COR-4 kit. Complete COR and CWID all on one board for easy construction. CMOS logic for low power consumption. Many new features. EPROM programmed; specify call $99



TD-2 TOUCH-TONE DECODER/CONTROLLER kit. Full 16 digits, with toll-call restrictor, programmable. Can turn 5 functions on/off. Great for selective calling, too! $79

AP-3 AUTOPATCH kit. Use with above for repeater autopatch. Reverse patch & phone line remote control are std .$79

AP-2 SIMPLEX AUTOPATCH Timing Board kit. Use with above for simplex operation using a transceiver $39

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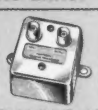

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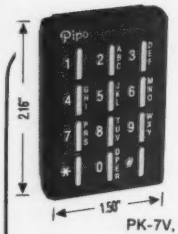

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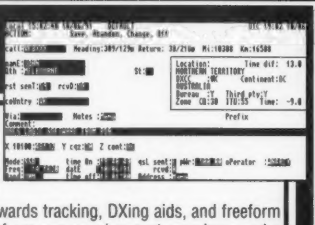

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CIRCLE 54 ON READER SERVICE CARD

Photo A. Paulo PY1ZT crosses the finish line, having made 42 QSOs en route on his IC-2SAT.

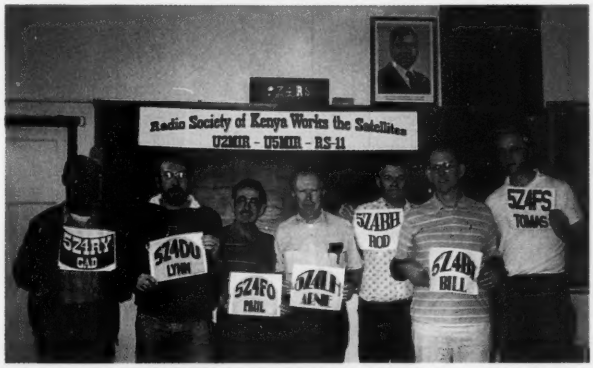

Photo B. Members of the Radio Society of Kenya who have worked the Russian satellites listed on the banner in the background.

were running the marathon, and we hope that next year even more will join us for this marvelous event, and who knows, maybe Paulo will break his own record for QSOs made during the 1991 RIO Marathon! After all, running 42.195 km while holding and operating radio equipment to the world deserves respect and admiration from all. Does the editor of the Guiness Book of Records know about PY1ZT and his success? Maybe we need to find out.

By the way, Paulo PY1ZT was ZY0SA at St. Peter/St. Paul DXpedition to the Rocks February/March 1989, together with Ron ZY0SB (PY1BVY).

ISRAEL

Ron Gang 4X1MK
Kibbutz Urim
D.N. Hanagev 85530
Israel
PACKET: 4X1MK@4X4SV.ISR.EU

The Callsign Game. Congratulations to Yosef Lior (ex-4Z9BFB), now 4Z5AA, of Timrat in the Galilee, who holds the distinction of opening up the new block of 4Z5 callsigns.

For some time we were wondering what new prefix would follow in the wake of the completion of the 4X6 series. From 1948 to 1966 the series from 4X4AA through ZZ was issued. Then up til 1988, the 4Z4 block was filled. More than a year ago, the last of the 4X6s, 4X6ZZ, was assigned. Then we started waiting.

Callsign assignment policy was once simplicity in itself. All two-letter suffixes were assigned in alphabetical order, with the Novices having an "N" tacked on which would be deleted upon passing the test for Grade B or Grade A. No old calls were re-issued, and you could tell who was licensed when, according to their call.

In 1987 policy changed, as the Ministry of Communications decided to give Grade A's (Advanced-Extra, approximately) the distinct 4X1 (and later 4Z1) prefix. Their old call could be re-issued to a family member passing the Grade B test. It is said that a few Grade A old-timers, fond of their old 4X4 or 4Z4 calls, refused to be pressured to take on the new "prize" prefix. It still remains to be seen what came out of these few hassles.

Following along with class-distinct callsigns, all Novices became 4Z9s with a three-letter suffix. Upon upgrading, they would be granted an entirely new call.

In the last year, previously unheard from 4X4 calls began appearing on the bands, whose youthful voices revealed that the Ministry had decided to do away with the "holes" in the callbook and issue the unheld calls to new licensees. Your faithful servant resigned himself to the apparent reality of no new prefix for much time to come, as among the 4X4s, 6's, and 4Z4's, a total of 2,028 callsigns are possible, and we don't yet have nearly that many currently licensed hams, not to mention the Grade A's and C's of other prefix distinction!

Unexpectedly, it came to our attention recently that 4Z5AA of the Galilee has inaugurated the long-awaited new series. Prefix hunters the world over—rejoice!

A New Israel Contest. The next Israel-International Contest is projected to take place on April 18, 1992. The rules will be published in our future issues *[if short enough]*. It will be a very interesting contest, with attractive prizes, and will be part of the special 100 hour Pesach activity of the IARC.

Refusing "Hitchhikers" Applying for IARC Membership Dani 4X4YM, chairman of the outgoing Israel Amateur Radio Club Membership Committee, said that there had been 150 new applications for membership in the IARC in the past year, yet only a third of them had been accepted. This curious state of affairs was explained, and later elaborated upon by Mr. Bar Sela of the Ministry of Communications. It turns out that in order to legally purchase a VHF/UHF scanner receiver, the Ministry of Communications requires that the applicant have either journalist's credentials or be a member of the IARC. Thus many people interested in no more than listening to police calls and cellular telephone conversations have been knocking at our door. The policy of the membership committee has been to prefer accepting only those with a real interest in amateur radio, rather than bolstering the club treasury with an additional 8,000 shekels (US$4,236) from those without an interest.

KENYA

Rod Hallen 5Z4BH
Box 55A
APO New York 09675

I've just returned from a mini-DXpedition to the Comoros Islands. I am D68RH down there. I had so much fun that I am planning to go back for the CQ WW Phone Contest the end of October. My tour in Kenya is up in December and I will be moving to Karachi, Pakistan. I've already written to a number of hams there but have received no response yet about licensing. I gather it will be difficult if not impossible to get a license. It will be a dreary two years if that is true.

The enclosed photo is of some members of the Radio Society of Kenya (RSK) who have worked the Russian satellites listed on the banner in the background. The gentleman whose picture is hanging above the blackboard is Daniel Arap Moi, the President of Kenya. The RSK has almost 100 members, but less than a dozen are truly active DXers.

73 from Kenya, Rod 5Z4BH, KB7NK, UK1HR, D68RH. *[We are certainly going to miss Rod's reporting on the goings-on in Kenya and the surrounding area.—Arnie]*

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Of course, it'd be even better if we could somehow experience all this right in our hamshacks without having to subject ourselves to high-G maneuvers. Well, Bill Wagner WB1ADF and Bill Kinton NX1D have worked out just such a system.

Vampire Mobile

Every year, in late September, the New England Escradrille group puts on the Warbirds Air Show at the Manchester, New Hampshire, airport. This is a chance for collectors and restorers of vintage military aircraft to show off their prize aircraft. One of the fighters that would perform during the show was a British training jet called the Vampire. It was manufactured during the '50s and is still in use in parts of the world. One of the interesting features of the Vampire is that it had a small glass porthole directly in the nose cone. A movie camera was usually mounted just behind the porthole and used during combat or training for reconnaissance, or to record the success of a mission. It seemed like the ideal place for a video camera!

Bill WB1ADF and Bill NX1D contacted Ed Stead of Stead Aviation (the owner of the jet) and proposed a way that spectators could ride along with the jet during its flight via an ATV link back to a TV receiver on the ground. Ed thought it was a great idea, and the ATV jet project was ready to take off.

The Remote-Control ATV System

Once the movie camera system is removed, there is a lot of room under the cowling of the jet for an ATV system. Special care had to be taken to ensure that the ATV transceiver (P.C. Electronics TC70-1) and the Ricoh 8mm camcorder were securely mounted. Bill NX1D built up a touchtone decoder circuit and modified the TC70 so that they could remotely turn the transmitter on and off via a VHF link. Also, he had the ability to select more than one video source (in the future they may have a cockpit camera looking over the pilot's shoulder). They originally planned on a 100-watt amplifier but weren't able to cure some power supply problems before the show. The amplifier could also be turned on or off via touch-tone commands.

Since they had a 2 meter uplink, they could use the subcarrier of the ATV transmitter to operate as the output of a crossband voice repeater.

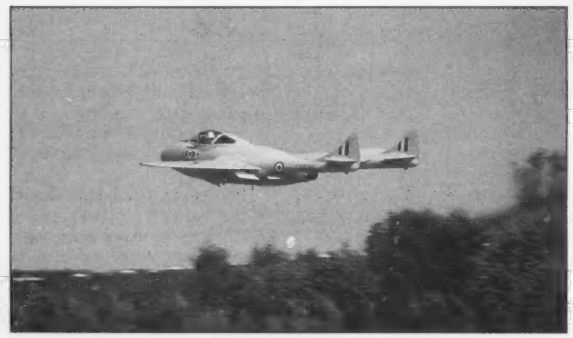


Photo A. The Vampire ATV jet takes off during the Warbirds airshow. Photo by Charles R. Cole.

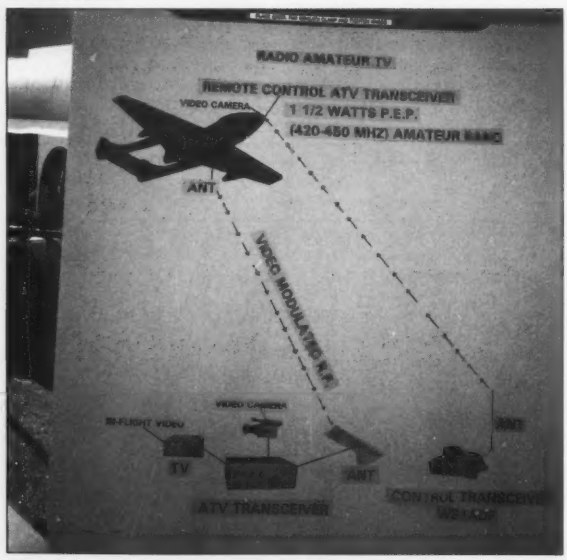


Photo B. The remote control ATV jet system. Chart drawn by Bill Wagner WB1ADF.

Photo C. The ATV package fits nicely in the nose cone of the jet. The camcorder looks through the gun camera porthole. (L to R:) Bill Wagner WB1ADF, Bill Kinton NX1D and pilot Doug Wood.

Photo D. Close-up view of the ATV installation. The P.C. Electronics TC70-1 was remotely controlled by touch-tone commands received by a small HT underneath the transmitter. An 8mm Ricoh camcorder not only provided the video signal for the ATV transmitter, but also recorded the flight on its video tape.

Loops and Rolls

Pilot Doug Wood took up the Vampire on several test flights prior to the scheduled show activities. It was a blast watching him do loops and rolls (without getting TOO dizzy!). Since they had an outside vertical antenna on the belly of the jet, the 1-watt ATV signal did quite well. ATVers as far away as the Boston area (40 miles to the south) had good reception at times, depending on the jet's altitude. A number of the ECAT (East Coast ATV Society) group could also watch the flight via the KA1AFE ATV repeater.

During the airshow, Bill WB1ADF and Bill NX1D had their receive station set up in the back of a Jeep next to a number of display booths. During the jet's flight, quite a crowd of fascinated spectators gathered around, glued to the spectacular views coming down from the ATV system. It was definitely a big hit with the crowd. Believe me, it takes something really intriguing to distract folks from watching passing planes at an airshow! The views from the jet were nothing short of amazing, particularly the high speed passes over the airport. After watching the jet video

Photo E. Bill Wagner WB1ADF mans the ground station during the flight, as fascinated onlookers gather about to watch the fantastic views from the jet.

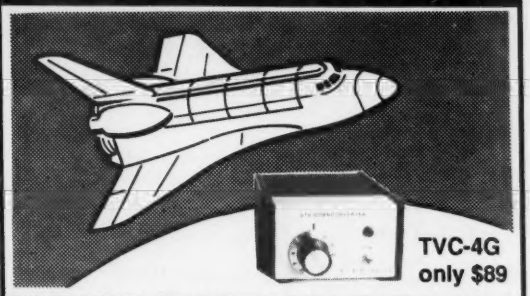
during its takeoff, acrobatics and landing, the crowd all felt as if they had gone along for the ride.

The Next Flight

Look for future flights of the ATV jet. Their next effort may include multiple camera views from the cockpit as well as the nose cone. Also, their 100-watt amplifier system should be in operation for some real DX reception of the jet.

Next month we'll show you the hardware details of the ATV jet system and how you can remotely control your ATV transceiver by touch-tone command. 73

AMATEUR TELEVISION



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UPDATES

The Mini-Keyer

Refer to the article, "The Mini-Keyer," by Klaus Spies WB9YBM in the May 1991 issue, page 14. The following corrections need to be made for proper operation:

1. A wire is missing from the schematic (see Figure 1 for the updated schematic). The junction of D2 and C3 needs to be connected to pin 7 of U2b. You need to run an additional jumper wire on the PC board to make this new connection as shown in Figure 3. For your information, the combinations of C3/R3 and C2/R2 are contact debouncers for the dash and dot paddle inputs respectively. For dash generation, the U2b flip-flop must receive its clocking input from the output of the U2a flip-flop. When the dash paddle is closed, 5 volts is fed from pin 7 of U2b, through diode D2, to pin 14 of U2a which causes U2a to toggle its output, thereby producing a clock for U2b.

2. Two changes need to be made to the PC board foil pattern: Pin 6 of U2 should be connected to pin 10 of U2. The foil pattern erroneously shows pin 6 tied to pin 11. In addition, pins 3, 2, 10 and 6 of U2 need to be tied to +5 volts as shown in the schematic. If you have already made up a PC board from the original article just cut the trace leading from pin 6 of U2 where it joins pin 11 and attach it with a small jumper or solder bridge to pin 10 instead. Then solder pin 2 of U2 with a small jumper or solder bridge to the +5 volt trace that passes next to pin 2. See Figure 2 for the correct PC foil pattern.

3. Improvements: U3 is shown as a 7432 on the schematic, but is listed as a 74HC32 in the parts list. The circuit is appropriate for a 7432 (TTL) part. If a 74HC32 (High Current CMOS) part is used instead, the C2/R2 values may be modified for much lower power requirements. R2 causes an 8 mA load on the output (pin 3) of U3 as originally shown. If R2 is increased to 4.7k and C2 decreased to 0.005 µF, the RC time constant is maintained but a much lower current drain results. The same values may be substituted for R3/C3 as well. If you want to experiment around, you may be able to increase the value of R2 by two orders of magnitude and still retain proper operation. One final note: You can reduce the current comsumption substantially by removing the LED indicator. *[Thanks to Dom Suppappola KA1VCR for this information.]* 73

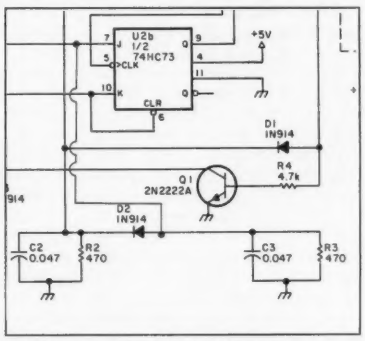

Figure 1. The corrected schematic (new connection shown in red) of the Mini-Keyer.

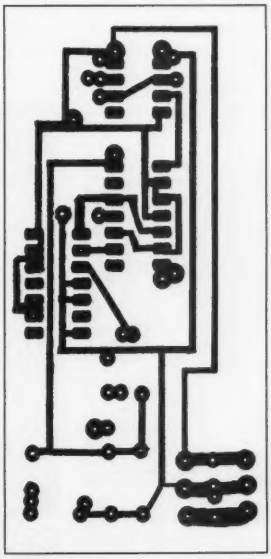

Figure 2. The corrected PC board foil pattern for the keyer.

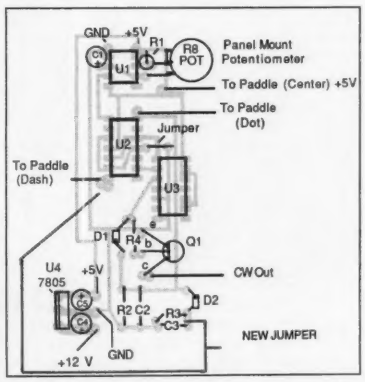

Figure 3. Location of the new jumper wire (shown in red) for the Mini-Keyer.

HOMING IN

Radio Direction Finding

Joe Moell, P.E. K@OV
P.O. Box 2508
Fullerton CA 92633

RDF Spans the Globe

Writing for *73 Amateur Radio Today* is great fun because you are contacted by enthusiastic readers near and far. In the last two weeks, I received inquiries on radio direction finding (RDF) from South Africa, Germany and Zimbabwe.

It takes personal initiative to get a ham license. You need persistence to study and take exams for upgrades. So, it's no surprise that hams everywhere have a penchant for self-improvement and friendly competition in all forms. Thus, we challenge ourselves to succeed in on-the-air contests, chasing certificates, and breaking VHF/UHF distance records.

Regular "Homing In" readers know that another way hams compete is RDF contesting, often called "foxhunting" or "T-hunting." One ham goes to a special place he's found. Usually it's either hard to find or it has unusual radio propagation to the starting point, where the rest of the participants begin. They will see who wins by getting to the hider first, or perhaps by having the least mileage.

With our love of mobility and inexpensive fuel prices (compared to the rest of the world), it makes sense that hams in the USA would choose mobile over on-foot foxhunts most of the time.

Stateside hunts are local events (no national championship here yet), and rules and customs vary widely. They range from short "first-in wins" events, covering only a few square miles, all the way up to rough-and-tumble marathons where almost anything goes. On the Southern California "All Day" hunt, for example, the boundaries are the continental USA! Of course, you can't get a reliable signal across the country on 2 meters (space shuttle astronauts can't be the hiders), but ending points have frequently been in adjacent states. Once, the hiders were on a mountain over 250 miles from the start.

European Athletes

RDF as a sport in Europe began over 50 years ago, and swept the continent in the '50s and '60s. Enthusiasts soon realized that formal tournaments added to the fun. The first official European Foxhunt Championship Competition was held in 1961, with eight countries represented. It was so successful that it grew into the International Amateur Radio Union Region 1 Amateur RDF (ARDF) Championships, usually held every two years.

Though contestants of any age are welcome, young people usually dominate the winners' positions. They aren't all licensed hams. Only the transmitter operators must have their tickets, so SWLs can and do compete. They must know a little CW, because that is how the transmitters are identified.

Five foxes transmit in sequence, and the hunters must find them in order. It's a map and compass exercise as well as an RDF test. To win, you have to keep track of your own position, and the bearings to the five beacons, at all times.

Many young people have discovered foxhunting from Scouting. At a Boy Scout World Jamboree in Norway, 150 receivers and another 150 kits were produced to give 2,800 participants from 90 countries a chance at "hands on" RDF.

Another major source of European competitors is the military. RDF teams of soldiers and reservists are common. In earlier years, hunts were on 3.5 MHz. Eighty meters is being steadily replaced by 2 meters as the most popular band for cross-country transmitter tracking.

Well-attended Region 1 championships would not be possible without widespread local activity. Many clubs are active in ARDF. Foxhunters like to home-brew their gear, and new designs continue to pop up (see Photo A).

Russian Radiosports

Exposure to technology and physical exercise are both important for young minds and bodies. That is why foxhunting is encouraged in the Soviet Union, especially for teenagers and pre-teens. School radio clubs are common. HF and VHF transmitting and receiving equipment is often hard to come by, and must be made on site. But RDF gear is rolling off a Russian assembly line.

US hams who attended the 1989 Friendship Radio Games in Khabarovsk reported that RDF sets were the only commercially manufactured ham equipment they saw while in Russia. The Barnaul Radio Factory in southwestern Siberia produces toys and electronic products. Flip through the factory's 18-page color catalog, and the first two products you'll see are hand-held RDF sets.

The Altai-145 2 meter sniffer (Photo B) is a complete receiver/antenna unit in one piece, except for headphones. The receiver is built into the boom of a 3-element yagi. It's easy to use—the foxhunter holds it overhead and orients the yagi for loudest signal in the earphones, then heads in the indicated direction. For safety, the yagi elements are made of curved steel tape that folds over instead of impaling the operator or breaking.

Eighty-meter foxhunts remain popular in the USSR. The factory makes the Altai-3.5 for that band, with a similar tuneable receiver and attached loop/spike directional antenna system. The loop is about one foot in diameter. Barnaul makes only one other ham radio product, called a Tisa. It's a transverter to allow 10 meter rigs to transmit and receive on 2 meters.

The Barnaul Production Association is eager to sell its RDF products worldwide. While suitable for foxhunting in some other countries, the design is not compatible with the needs of T-hunters in the USA. The Altai-145 is meant to track CW transmitters and has approximately 7 microvolts sensitivity. US hams usually use FM and require a "hotter" front end. The VFO-tuneable (non-synthesized) Altai receiver is not stable or selective enough to work in the intense RF environment of most cities in the USA.

The Brits are Different

Englanders like foxhunting (both the radio and horseback hound-chasing kinds), but ARDF there is a world apart from events on the European continent. British hams hold their hunts on 160 meters, just as they have for about 70 years.

There are frequent local contests throughout the year, requiring entrants to find one to four transmitters in an afternoon or evening, with winners having the shortest elapsed time. Starters anticipate a drive of 10 miles or so to each fox, followed by a lengthy walk.

After some National Qualifying Rounds, the National Final Championship occurs each September. Three transmitters are hidden in well-spaced locations. They all provide a physical challenge, such as patches of nettles, swamps, and large decoy antennas that re-radiate the 160 meter signals.

The Radio Society of Great Britain heavily promotes RDF outings. RSGB is encouraging members to add 2 meters to local events, and is also setting up European-style hunts. The Society hopes that G-calls will someday be listed among the Region 1 championship winners.

High-Tech in Japan

Nowhere on earth is RDF competition more popular than in Japan, where it's often called "foxteering" or "foxtailing." Just as we have ATV societies

Continued on page 73

Photo A. Roel Bolt PA3CDO tests his experimental 3-element phased array for 2 meter RDF. He also built a companion portable superhet RDF receiver for the local competitions in Apeldoorn, The Netherlands. (Photo by WB6UZZ.)

Photo B. This RDF set for 2 meters is one of the few pieces of Amateur Radio gear being manufactured in Russia. Foxhunting is a regular activity for many school radio clubs there, for both SWLs and licensed hams.

Photo C. Hams in Japan like foxhunts in vehicles as well as on foot. JP1IGV (the driver) and an SWL partner are ready to roll. (Photo by JQ1LCW.)

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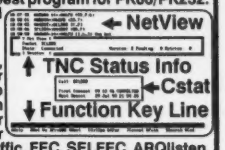

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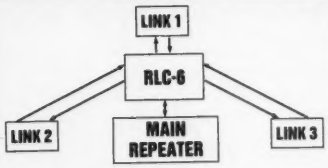

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9600 BPS Modems

Since the October column, I've received requests for more information about 9600 bit-per-second (bps) packet operation via the University of Surrey low-earth-orbit satellites UoSAT-OSCAR-14 and 22. The effort needed to get on these high speed packet satellites may seem formidable at first, but when the tasks are broken down into separate small projects, it's really quite simple to get a system on the air.

High speed packet activity at 9600 bps is not as common as 1200 bps, but is the only speed currently available from U-O-14 and 22. Radios sometimes require modifications to operate properly in both receive and transmit at this speed, and always need internal wiring additions to make the connection to appropriate high speed modems. This has stopped many potential enthusiasts from becoming active at faster data rates. Future radios will likely have data ports for these connections, but for now, it's necessary to make the changes on stock equipment which the designers never envisioned would be used for these purposes.

Small Projects

To prepare a station for activity at 9600 bps via satellite, there are several items that must be considered. U-O-14 and 22 operate via Mode J with a 2 meter uplink and 70cm downlink. U-O-14's FM uplink is on 145.875 MHz with an FM downlink of 435.070 MHz, while U-O-22 comes down on 435.120 MHz with the uplink on 145.900 MHz. A 9600 bps modem with TNC2-compatible packet controller, FM radios, antennas, a PC-compatible computer, and appropriate software are required to make connection with these bulletin board systems (BBSs) in the sky.

PacComm and TAPR Modems

The component at the heart of any UoSAT earth station is a high speed modem such as those available from PacComm and TAPR (The Tucson Amateur Packet Radio Corporation).

PacComm Packet Radio Systems, Inc., carries different versions of their NB-96 series 9600 bps modems ranging from cards for internal TNC-2 mounting to complete high speed, narrowband radios. For satellite work, either the MCNB-96 modem card for $109.95, or the EMNB-96 external modem for $174.95, is fine. The modem design was licensed from James Miller G3RUH and has been in production from PacComm for three years.

These products are not kits. They come complete with cables and instructions for interfacing to existing TNCs and computers. Details concerning the design and use of this modem can be found in James Miller's paper "9600 Baud Packet Radio Modem Design" in the "ARRL Amateur Radio 7th Computer Networking Conference Proceedings" dated October 1, 1988, available from the ARRL. PacComm can be reached at (800) 223-3511 or (813) 874-2980. Their address is 3652 W. Cypress Ave., Tampa FL 33607-4916.

The TAPR high speed modem by Steve Goode K9NG was originally designed for half-duplex operation. Details were outlined in Steve Goode's paper "Modifying the Hamtronics FM-5 for 9600 BPS Packet Operation" in the "ARRL Amateur Radio 4th Computer Networking Conference Proceedings" dated March 30, 1985, also available from the ARRL. A single modem will not provide the full-duplex ability needed for satellite activity. Since a complete kit, including double-sided board and all parts sells for $35.00, it's cost effective to buy two to create one full-duplex modem.

One TAPR board can be wired as a MOdulator and the other as a DEModulator. The push-to-talk (PTT) line from the TNC does the job for satellite work, thus the original specialized modem PTT circuitry can be omitted on both boards. Clock signals from the TNC are routed to both boards, while transmit audio and receive signals are sent to the appropriate "MO" and "DEM" unit. Integration is simple and only one control, for transmit signal level, needs adjustment. This is set for three kHz FM deviation.

TAPR can be reached at (602) 749-9479, or write to: P.O. Box 12925, Tucson AZ 85732.

The TNC

The high speed 9600 bps modem needs a terminal node controller with a modem disconnect header. A list of U-O-14 users shows that most use variations of the TNC-2 design. In the U.S., many use PacComm TNCs with the NB-96 modem, while foreign U-O-14 enthusiasts have TNC-2s (or clones), with the original G3RUH modem sold by James as a "semi-kit" including a bare board, ROMs and documentation.

The modem disconnect header is the most important feature a TNC needs for 9600 bps use. This allows the internal TNC modem to be easily bypassed. Most TNCs have a disconnect header or a place on the main circuit board to install one. Modem documentation usually provides instructions for cutting one or two lands in the TNC when the external modem is attached.

A useful, but uncommon, feature in TNCs is a data rate to the computer greater than 9600 bps. Buffering problems are possible if both the TNC and computer are used at 9600 bps. Most TNCs are not wired to go faster, but with a few simple modifications, a TNC-2 can be configured for 19,200 bps operation.

The TNC-2 has several speeds for data transfer via the RS-232 jack from 300 to 9600 bps. The 300 bps dip switch setting is the least useful. To replace the function of the 300 bps switch with 19,200, first isolate pin 1 of SW2 from other lands on both sides of the circuit board. Reconnect pin 1 on SW2 to U1 (CMOS 4040) pin 10. If lands are cut to isolate pin 1 on SW2, be sure to reroute wiring that originally went through pin 1. Replace U3 (MC3403 quad operational amplifier) with a faster op amp such as the TL084. The TNC can now be used at 19,200 bps on the computer side when SW2 position 1 (previously 300 bps but now 19,200 bps) is selected.

Radios

A sensitive FM receiver capable of tuning increments of 2 kHz—to allow for Doppler shift tracking—should be used for the downlink. Most receivers have relatively narrow front-end filters

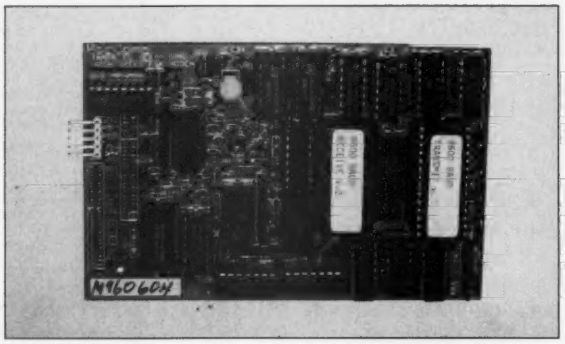

Photo A. PacComm High-Speed FSK modem for full-duplex 9600 bps.

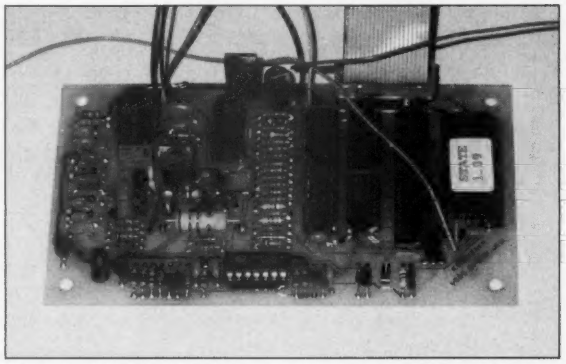

Photo B. K9NG/TAPR 9600 bps modem for half-duplex applications. Two of these modems provide full-duplex 9600 bps.

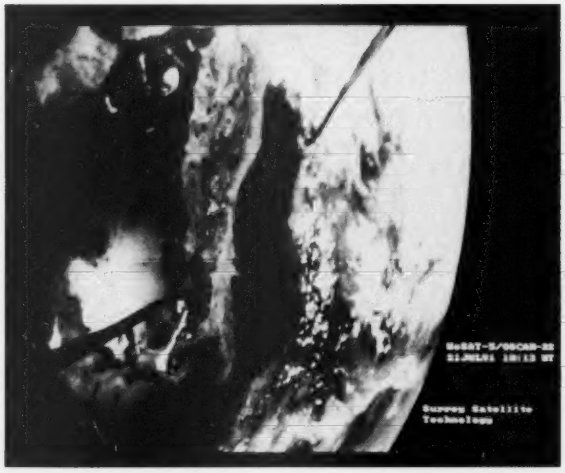

Photo C. A spectacular view from the camera on board U-O-22 as it passes over Italy.

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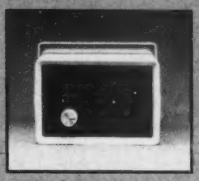

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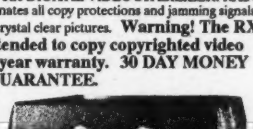

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since they're typically used only for voice reception. Although modifications can be made to widen the filters, usually requiring the replacement of a single filter unit, most will work fine without changes as long as the tuning can be adjusted during the course of a satellite pass.

The usual audio output from the receiver cannot be used due to the nature of high speed data. It's too wide for the radio's audio stages. Connection must be made directly to the output of the receiver's FM discriminator circuitry. *The ARRL Handbook* provides examples of what to look for when attempting to identify discriminator circuits.

For many newer transceivers and scanners, the connection is simple. An MC3357 (or similar) IC is used for the FM receiver. A shielded wire to pin 9 is all that is required. For older radios and those without this chip, a schematic search is in order. Generally, the discriminator output can be found just before the audio amplifier stages where two diodes, aimed in opposite directions and connected to a common point, are located.

John Branegan GM4IHJ wrote a very descriptive article, "Low Budget UoSAT-OSCAR 14 9600 Baud Reception" for the September 1990 issue of *The AMSAT Journal*. John described connection methods and bandwidth widening procedures for several radios. Preparing a receiver for 9600 bps reception can, in many cases, be very simple. When a good preamplifier is used in conjunction with a wide front end, tuning increments of five kHz are possible. A Yaesu FRG-9600 scanner works fine without changes and only a simple connection to the MC3357 and the addition of a preamp. The same is true for many other rigs.

A true FM 2 meter transmitter is required for the uplink. Phase-modulated rigs may be difficult or impossible to use without serious modifications. Frequency resolution should be at least 3 kHz, although many operators have done very well with rigs that tune in 5 kHz increments. The power output should be at least 10 watts.

The 2 meter transmitter must be properly connected to the modem. Finding the appropriate modulation input point and correctly setting the drive level are the most difficult portions of this task. The July 1991 issue of the *Packet Status Register* from TAPR contained a short article from James Miller titled "FT-736 and 9600 Baud Operation." James described how to find the varactor diode used in the Yaesu FT-736R 2 meter modulator, and how to drive it properly.

For nearly all transmitters, once the varactor diode has been found, the modem's transmit output signal can be coupled to the low-level, audio input side of the varactor, and adjusted via the modem's transmit-drive level potentiometer for proper operation. The PacComm unit is ready for connection when the drive point is found. The TAPR board should be connected to the radio through a 10 microfarad capacitor (already on the PacComm board). In transmit, the transmitter should be set for 3 kHz deviation.

Antennas

Most U-O-14 and U-O-22 users have directional arrays. This is not because the UoSAT activity demands high-gain arrays, but rather because the antennas are used for other satellite activities requiring large arrays. Very small yagis, home-brew dual-band J-Poles, small helix beams, and even omni-directional antennas have been used successfully for UoSAT work.

If high-gain antennas are used, remember that accurate tracking will be needed to keep the satellite in the useful beamwidth of the antenna. A typical pass may only last 20 minutes from horizon to horizon. If an automated antenna tracking system is not available, the operator will be typing, reading a satellite beam heading list, adjusting for Doppler, and positioning the rotators all at the same time.

Computers

The best software for UoSAT use was written for IBM PCs and their clones. The programs PB, PG, PHS and PFHADD are available free on many BBS systems and include complete documentation on their use. They are also available from AMSAT for a small fee. Write to AMSAT at 850 Sligo Ave. #600, Silver Spring, MD 20910 or call 1 (301) 589-6062 for details.

PB sets the TNC to KISS mode and allows reception of broadcast files from the satellites. It can also be used to begin file broadcasts and fill holes in received files that have been heard but not completely received and stored on disk.

PG provides complete connected uplink and downlink activity with the satellite while PFHADD prepares files for uploading and PHS processes received files for viewing and use.

Hundreds of text, data, picture and voice files have been sent through U-O-14, while dozens of picture files have been made available through U-O-22 in conjunction with its on-board camera experiment.

Try It

Since the launch of U-O-22, many new callsigns have appeared on U-O-14 and U-O-22. Although U-O-14 has been in orbit for nearly two years, this satellite is attracting attention now due to the camera system on U-O-22 (see Photo C for a spectacular view of Italy from this satellite). Hams have discovered the versatility of an international BBS in orbit that can send and receive files of all types at a speed eight times faster than the usual terrestrial system.

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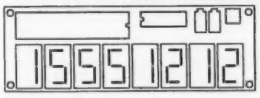

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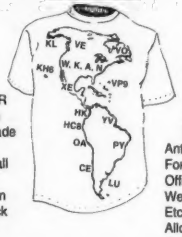

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The "Cheap and Simple" Power Supply Revisited

Improved regulation for a classic power supply.

by Vern A. Weiss WA9VLK/GØNBZ

The year 1981 gave us our hostages back, our White House Gipper and our first space shuttle mission. It also gave us "Cheap and Simple, your basic 13.8 volt, 25-A power supply," published in the January 1981 issue of *73 Magazine*. This article described a 13.8 VDC (variable if you want), high-current supply capable of delivering 15, 25 or even more amperes. The circuit was certainly more than adequate for the likes of me, but for some of you, its 0.4 VDC drop at full load was unacceptable.

The other day when Gorbachev and I were on the phone discussing this no-code thing, he said to me, "Can we really get Hewlett-Packard regulation at bargain-basement prices?" I replied, "Probably not, but maybe we can come close." There are better voltage regulators around than the 7812, which is the one specified in the 1981 "Cheap and Simple" article. You have to go a long way to beat the LM317 or LM200H. But let's stick with the 7812 because it's very affordable and it's always available at the local Radio Shack.

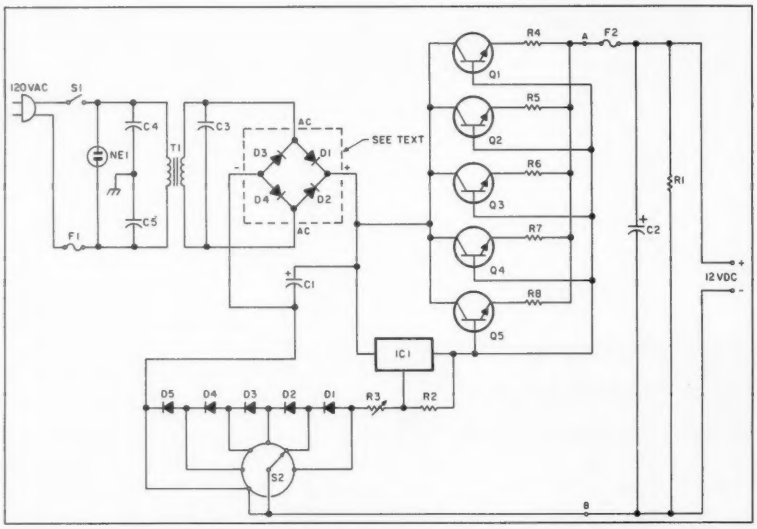

Figure 1. The original "Cheap and Simple" circuit as it appeared in the January 1981 73 Magazine article.

Revising the "Cheap and Simple"

Figure 1 shows the original "Cheap and Simple" circuit. Enjoy switch S2 and diodes D5, D4, D3, D2 and D1 while you have them because in the new circuit (Figure 2) they will be gone.

What we have done is simply establish output voltage feedback so that IC1 can compensate for voltage decreases under load. Monitoring the output voltage, as we have done, improves regulation. That will keep Daniel Ortega and other critics of my 0.4 VDC full-load drop happy.

Another hint for builders of this supply is to switch capacitors C1 and C2. The January 1981 article's "Parts List" showed C1 as a 13,000µF, 25V electrolytic and C2 as a 10µF, 25V electrolytic. The parts list should have shown C1 at 10µF and C2 at 13,000µF. If you followed the text, your project probably went smoothly, but if you relied too heavily on the parts list (and, I admit, I am as guilty of this as the next guy), your capacitors may have become impossible to get along with.

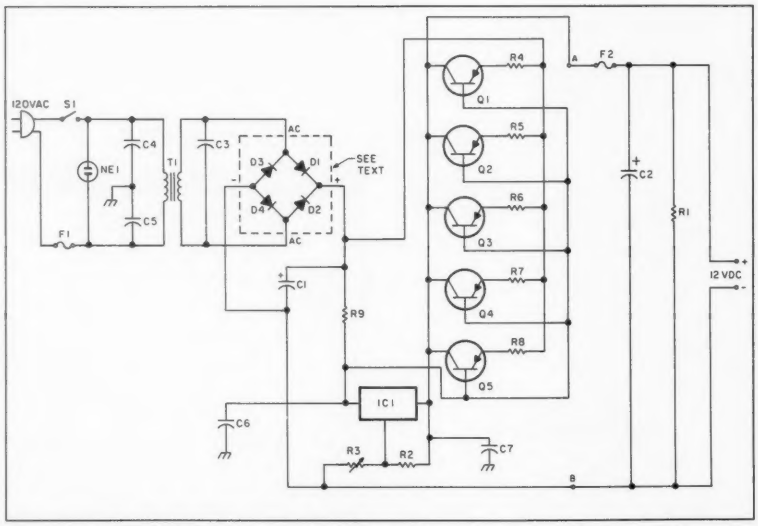

Figure 2. The modified power supply circuit monitors the output voltage, thus improving voltage regulation.

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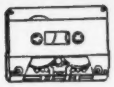

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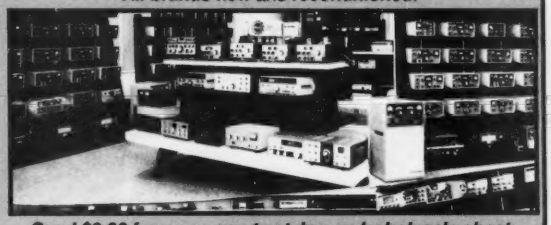

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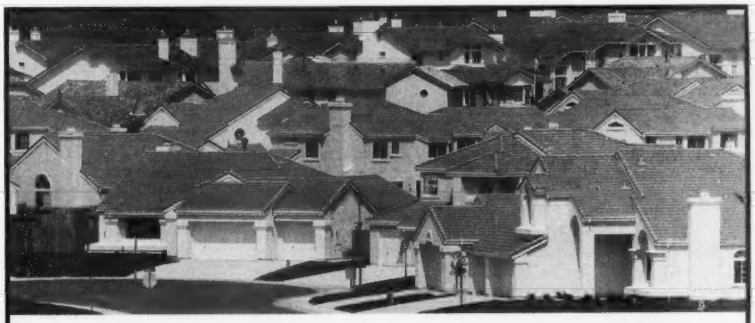

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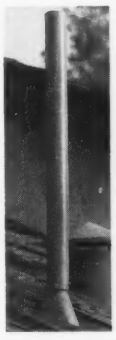

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CIRCLE 228 ON READER SERVICE CARD

Component parameters can differ greatly between companies, especially when we start comparing a new component with one that has been stored beneath the septic tank since 1960. If your supply isn't performing like you think it should, and you've followed my suggestions to a tee, try **NOT** following them to a tee. Experiment with other components of similar values. I would not, however, actually imply that you should use **NEW** components, fresh and within manufacturer's tolerances. That approach gets into money that defeats the purpose of "Cheap and Simple." We are ham operators, remember, and pride ourselves in building anything electrical from common items found easily in any household in America. 73

Contact Vern A. Weiss WA9VLK/G0NBZ at 4259 Park Place, R.R. #5, Lakes of Four Seasons IN 46307.

Revised Parts List

C1	10µF, 25V electrolytic capacitor
C2	13,000µF, 25V electrolytic capacitor
C3	0.22µF, 100V tubular capacitor
C4, C5	0.01µF, 500V ceramic capacitor
C6, C7	0.1µF ceramic capacitor
D1–D4	25 amp diodes or bridge rectifier
F1	5 amp fuse
F2	30 amp fuse
Q1–Q5	2N3055 transistors (mount on large heatsink)
R1	120Ω, 4W resistor
R2	220Ω, 1W resistor
R3	5k Ω, 2W resistor
R4–R8	0.25Ω, 1W resistor
R9	6.2Ω, 1W resistor
IC1	7812 voltage regulator
S1	SPST switch
T1	120/17–24 VAC power transformer (NOTE: must be able to handle full current)

Miscellaneous: NE1 neon bulb, binding posts, line cord, 0-25 VDC voltmeter, 0–30 amp ammeter, heat sinks, chassis, blower, fuseholders, and bulb socket.

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- Birdie log during frequency search automatically characterizes your R7000, then locks out those frequencies during frequency search operation.
- Custom interface has electronics to allow software control (by channel number) of external tape recorder.

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Model	Pin (W)	Pout (W)	Ic (A)	Gain/NF (dB)	(13.6 V) Type
50 MHz					
0508G	1	170	28	15/0.6	Standard
0508R	1	170	28	–/–	Repeater
0510G	10	170	25	15/0.6	Standard
0510R	10	170	25	–/–	Repeater
0550G	10	400	60	15/0.6	HPA
0550RH	10	400	60	–/–	Repeater HPA
0552G	25-40	400	55	15/0.6	HPA
0552RH	25-40	400	55	–/–	Repeater HPA
144 MHz					
1403G	1-5	10-50	6	15/0.6	LPA
1409G	2	150	25	15/0.6	Standard
1409R	2	150	24	–/–	Repeater
1410G	10	160	25	15/0.6	Standard
1410R	10	160	24	–/–	Repeater
1412G	25-45	160	20	15/0.6	Standard
1412R	25-45	160	19	–/–	Repeater
1450G	10	400	54	15/0.6	HPA
1450RH	10	400	54	–/–	Repeater HPA
1452G	25	400	50	15/0.6	HPA
1452RH	25	400	50	–/–	Repeater HPA
1454G	50-100	400	45	15/0.6	HPA
1454RH	50-100	400	45	–/–	Repeater HPA
220 MHz					
2210G	10	130	20	12/0.7	Standard
2210R	10	130	19	–/–	Repeater
2212G	30	130	16	12/0.7	Standard
2212R	30	130	15	–/–	Repeater
2250G	10	220	42	14/0.7	HPA
2250RH	10	280	45	–/–	Repeater HPA
2252G	25	220	36	14/0.7	HPA
2252RH	25	280	40	–/–	Repeater HPA
440 MHz					
4410G	10	100	19	10/1.1	Standard
4410R	10	100	18	–/–	Repeater
4412G	20-30	100	19	10/1.1	Standard
4412R	20-30	100	18	–/–	Repeater
4450G	10	175	34	12/1.1	HPA
4450RE	10	175	34	–/–	Repeater HPA
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4452RE	25	175	29	–/–	Repeater HPA

MODEL 1410G

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144 MHz	1420N	.5	24	N
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220 MHz	2220N	.5	22	N
440 MHz	4420B	.5	18	BNC
440 MHz	4420N	.5	18	N

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KD8JN's QRP Achievements

If you have never taught a Novice class, you're missing out on a lot of fun. When I teach a class, we have a good time. That's the way it's suppose to be, right? The class learns all about deep earth antennas, dark emitting diodes, and feedlines long enough to reach from the antenna to the radio.

Now I guess you're wondering what this has to do with QRP. Well, one of the young men in my class turned out to be one hell of a QRPer and DXer. This month we'll take a peek inside the shack of Randy Phelps KD8JN (see the Photo).

Randy works on all bands and most modes, including RTTY and packet, although not necessarily with QRP. When the HF bands are running, you'll see Randy's TNC sending to the DX cluster NODE. In the shack you'll find a Heath SB-220 ready and willing to break through the pile-up to work a new DX station if need be.

However, the DX total with just the 2 watt Argonaut 515 is very impressive. Randy has over 202 stations worked and 164 stations confirmed. The skill needed to work, using a pea-shooter, side by side with the big guns, really paid off.

Randy took first place, single op, all-band U.S.A. 8th district place in the 1989 CQ World Wide DX contest in the QRP section. He also impressed the neighbors with his first place single op phone, Ohio section, in the 1989 ARRL DX International DX contest. Not bad considering the amount of RF power used was less than that required to run the PK-232!

QRP Antennas

Randy will be the first one to admit the need for a better-than-average antenna farm when running QRP and chasing DX. Randy's antenna installation would make any ham's want list. Nope, it's not comprised of three monoband beams placed a full wavelength apart. It's a TH6 DXX tribander in a city lot. Simple wire dipoles are used for 40 and 80 meters. What makes Randy's systems click is smoothing out all the rough edges.

I've discussed these before, here in the "QRP" column. All the antenna's hardware is stainless steel. Every PL-239 has a silver plated-Teflon™ insulated center. No hamfest cheapies here! The feedline, while just coming short of nitrogen-filled 7/8" hard-line, is the best you can buy. You'll find no "barrel" connectors in any of Randy's feedlines. There is only one RF power meter/SWR bridge in his shack. And finally, everything in the antenna farm is designed to be used at the maximum legal power.

As you can see, Randy is a very active ham. I'll get a call from him during the contests asking if I have a 5Y4GT. I can't let this one go, so I tell him, "No, but I think there's one in the junk box." Next time you hear Randy on the air, ask him if he has a 5Y4GT.

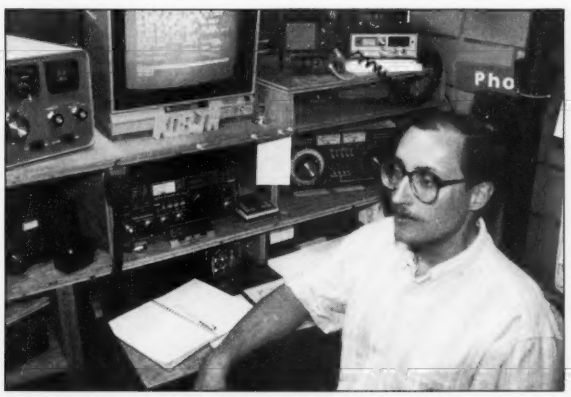

Photo A. Avid DXer and QRP enthusiast Randy Phelps KD8JN at his operating position.

Expanded Voltmeter

Several months ago I had a small circuit for expanding the range of a 0–50 µA meter to read 10–15 volts. It was a simple little circuit using a 10 volt zener diode and some resistors. This month I'll show you an expanded voltmeter that works even better.

Take a look at the schematic. The voltage reference this time is nothing more than an 8 volt regulator. An LM78L08, to be precise, and a resistive voltage divider. When coupled to a 0–50 µA meter, the range will be 10–15 volts. What makes this circuit a bit better is the ability to zero the meter at exactly 10.0 volts on one end, and 15.0 volts on the other end. When using only the 10 volt zener diode, sometimes the meter would not fall to 10 volts, when in fact the battery voltage is 10 volts.

The circuit may be built on a small perfboard or PC board. Make the board small enough to mount directly to the back of the meter. Use good quality parts for the meter; they will reflect higher accuracy.

To calibrate the expanded voltmeter, adjust the 1000 ohm trimmer so that the meter reads zero with 10 volts at the input. Raise the input to 15 volts and set the 20k trimmer for full scale (15 volts); you might want to re-check the setting by running through them a second time. Be sure to use a good, high quality digital voltmeter when setting up the circuit. With a good digital meter for reference, you'll have resolution down to 0.1 volt—or better.

I used a 0–1 mA meter in place of the 0–50 µA meter. Doing this, I had to change the value of the 56k resistor in the voltage divider. I had to drop the resistor's value to 4.7k to get the meter to operate correctly. With the 0–1 mA meter, the circuit draws 27 mA from the battery you're checking.

That's all for this month. I still have some Pulse Charger kits left at $29.95 + $2.50 P/H. Great project to charge up those gelled lead-aid batteries for winter projects.

Getting deep into winter, homebrewing goes into full gear. Next month we'll look at Mike's Rules of Ten. 73

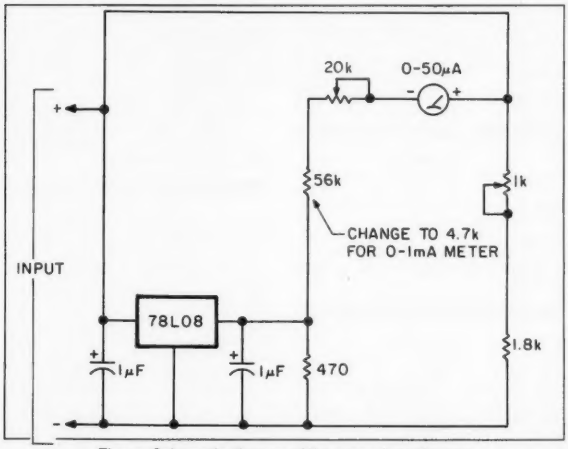

Figure. Schematic diagram of the expanded voltmeter.

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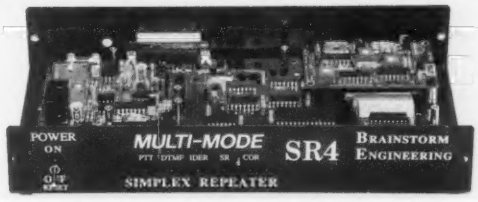

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Oops! It DOES Exist

How could I have been so blind? I mean, it was right there, under my nose. All I had to do was look for it! In the October 1991 "RTTY Loop" I mentioned that some amateurs were looking for interfacing for their Commodore computers on RTTY, and I said that the old Microlog stuff was great but no longer available. Was I wrong!

Thanks to Michel Ricard VE2DDT and others, my attention has been drawn to the advertisement on page 26 of the same issue of *73*. G and G Electronics of Maryland is just the answer for the amateur looking to put his or her Commodore computer onto the air.

The upshot of this is that I had a delightful conversation with Jeff Goldman, of G and G Electronics, who gave me some background on the situation. It seems that G and G was a dealer and service facility for Microlog equipment, both companies being located in Gaithersburg, Maryland, a suburb of Washington, DC. Microlog decided to pursue other markets, and the amateur line was in danger of being orphaned. That's when G and G stepped in. With the original equipment and plans produced by Microlog, they have tooled up to continue to produce this line of amateur computer RTTY equipment.

The G and G line currently features five systems or devices, which can, among other things, put your VIC-20 or C-64 on the air as a receive-only unit, multimode transceiver, or intelligent terminal. The units are affordable, and represent quite a bang for the buck!

The Morse Coach

Here's a simple plug-in cartridge for the expansion port on a C-64 that enables a complete, computer controlled Morse teaching plan. In use by government agencies and military programs, this trainer is as useful for the individual as it is for club programs.

An "Alphabet" mode presumes no prior knowledge of Morse, and sends the characters at a minimum 10 wpm character rate, with variable spacing for the slower rates. This avoids the "dit counting" pitfall well known to instructors. (Uncle Wayne's tapes work the same way!) A "Practice" program sends a predetermined number of five character groups, with the student typing in the answers. After the run, a score is displayed. In the "Speed Test" routine, getting less than 80% correct aborts the test.

Both of these latter tests employ logic to allow for the characters to get "out of sync" by either missing a key or hitting a key twice. Lacking that, one miss could throw the entire test out of line.

Overall, the Morse Coach may be just the answer for individuals, clubs, or groups studying for a Morse code test.

The SWL Cartridge

By plugging this simple cartridge into your C-64 or C-128 expansion port, you can turn your computer into a RTTY and Morse receiver. All it needs is receiver audio, and the screen displays a real-time clock, mode and speed in use, and status indicators, along with the incoming text. Reception of five-level Baudot at 60, 66, 75, 100 and 132 wpm is supported, along with ASCII at 100 and 300 bauds, and Morse from five to 99 words per minute.

A video "cross" display is simulated for RTTY tuning and a red dot for Morse. Audio is piped through the TV speaker so that monitoring the band becomes an easy matter.

Along with the SWL Cartridge, an AIRDOS disk program is available, which allows saving the received data to disk. Printer output is provided to the standard computer printer, with either manual or keyword control. If receiving Morse or RTTY is your desire, this may be just the package.

ART-1 All-Mode Terminal

Here's a multi-mode controller that plugs into your C-64 or C-128 and provides a wide range of digital modes in a small package. The ART-1 features RTTY, ASCII, Morse, and AMTOR, in a box less than six by six inches big.

Physical connection to the C-64 or C-128 is via a cable to the user port. Radio input is via receiver audio, and transmit output may be positive voltage switching for CW and FSK, AFSK tones for microphone input, and PTT transmitter control. No power supply is required, all operating voltages being obtained from the host computer.

As with the SWL, operation on Morse at speeds up to 149 wpm, on RTTY at speeds from 60 wpm (45.45 bauds) to 132 wpm (100 bauds), and ASCII at the standard 110 and 300 bauds, is supported. Additionally, four AMTOR modes are supported: Mode A (CHIRP), Mode B (FEC), Collective/Selective Broadcast, and Listen Mode (eavesdrop Mode A).

With the same on-screen tuning cross or light, operation of this little wonder is straightforward and should provide years of flexible communication.

AIR-1 Cartridge

The preceding units were designed for the C-64 or C-128; here is one for the "lowly" VIC-20. The AIR-1 cartridge provides full RTTY, Morse, and AMTOR operation in a plug-in cartridge at a budget price.

Fitting directly into the computer's expansion port, this cartridge takes receiver audio and puts out positive and negative switched levels for RTTY and CW, plus AFSK tones for microphone keying. As with the others in the line, support for Morse to 149 wpm, Baudot from 60 wpm to 132 wpm, and ASCII at 110 or 300 bauds, is provided. AMTOR support is also available in the same four modes as the ART-1. A real-time clock, selective calling, WRU (who are you), and multiple transmit buffers make the AIR-1 a fully functional unit.

There is even a code practice routine built in, to send random five-character code groups at any programmed speed. A true RTTY demodulator is built in as well, handling the standard tone pairs of 2125/2295 Hz, with switch-selected mode or narrow shift.

AIRDISK

If you have a terminal unit and Commodore computer, the AIRDISK may be just what you're looking for. Containing the software of the AIR-1, but not the hardware, this program adds the all-mode capability of the AIR-1 to VIC-20 and C-64 computers for less than forty bucks.

As with the others, operation is on all modes, with the same spectrum as the AIR-1. On-screen tuning and software digital filtering makes operation on the bands a piece of cake. This program acts as a software interface between just about any terminal unit and your computer, allowing you to either use one you have, or experiment with new demodulator designs.

Both VIC-20 and C-64 programs are on the same disk, with the VIC-20 requiring at least 16K of RAM in the computer. For those C-64 users who do not want or have a disk, an AIR-ROM software cartridge is also available. If you have a demodulator you are happy with, this is certainly the most cost effective way to go.

Overall, we all need to thank G and G Electronics of Maryland for promoting the old Microlog line. Far too often in the amateur RTTY world we have seen wonderful equipment produced then discontinued as the manufacturer abandons the ham market. Several such units are sitting on my shelves now. Fine though they were, they were dead ends on the road of technological development. By continuing to support our market, G and G deserves our support in return. Thanks!

Next month I may have another program for the MS-DOS crowd with potent possibilities. In the meantime I look forward to hearing from you by mail or on CompuServe (ppn 75036, 2501), Delphi (username MARCWA3AJR), or now on America Online as well (screen name MarcL9). I'll tell you more about America Online in the future, too, don't worry! 73

Morse Coach	C-64	$ 49.95
SWL Cartridge	C-64/C-128	$ 69.95
AIRDOS	disk	$ 15.00
Pkg. of all three:		$119.95
ART-1	C-64/C-128	$199.00 *w/program disk*
ART-1	cartridge	$ 59.95 *program on ROM*
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Keys to Motivation

The theme of this month's column is *motivation*. There is probably no other factor that is more directly responsible for the success or failures we experience in life than that of motivation. It permeates and affects everything we do, but it is especially important for those of us who are teachers or instructors to understand the importance of motivation in the learning process. Someone once said, "The man who believes he can do something is probably right, and so is the man who believes he can't."

Those of us who stand in front of the classroom must never forget that the youngster or adult who is sitting before us needs a reason to be listening, a desire to learn, and a belief that he or she can master the material. All of us require motivation to master new skills and grow.

The teacher of a technical subject should be especially sensitive to the ability levels of the students, and be sure to present the curriculum in a way that is relevant to their needs.

A Quiz

Try to imagine how you would feel if a teacher were to give you just five minutes to translate and react to the following popular adages (see the answers at the end of the column):

1. Avian species of identical plumage congregate.
2. Freedom from encrustations of noxious substances is contiguous with conformity to divine prescription.
3. Pulchritude possesses solely cutaneous profundity.
4. A superannuated canine is immune to indoctrination to innovative maneuvers.
5. Ululate not over precipitated lacteal secretion.
6. All that coruscates with resplendence will not assay auriferous.
7. The existence of visible vapors from ignited carbonaceous materials confirms conflagration.
8. Mendicants are interdicted from elective recipiency.
9. Probity gratifies reflexively.
10. Inhabitants of vitreous edifices ill-advisedly catapult petrous projectiles.

If you're like most of us, you experienced frustration and anxiety while rushing in to translate the words a teacher told you to respond to. Every day, all across the country, children are sitting in classrooms feeling frustrated and anxious because they don't understand what's being said to them. It may be English that's being spoken, but it's not appropriate to the children's ages or abilities, and it's certainly not relevant to their lives.

Specific Points

Diana Ramsey, in her book *Keys to Motivation*, notes some research findings for teachers to keep in mind.

1. In order for a learner to take a risk in the learning environment, the learner must perceive that risk as being manageable.
2. The degree of risk present in a learning situation is uniquely perceived by each learner.
3. The teacher, as motivator, can create a classroom climate where risk-taking is part of the learning process. Exploration, growth, and learning result from students mastering challenges the teacher presents.
4. The #1 motivator is an opportunity for success.
5. Students learn best when they are fully involved and appropriately challenged. The teacher should initiate a rotation of challenge and success.
6. Learners must see a payoff for their efforts if motivation is to be maintained.
7. Both boredom and fear decrease student opportunities to learn. Fear and boredom are negative stresses, especially when they are sustained over a long period of time. Hence the phrases "bored to death" and "scared to death."

Dialogs with Self and Other

Positive affirmations are statements we should learn to use and encourage more often in our daily lives. They are especially important in the classroom. We all draw strength from many sources—a higher power, our parents, family, friends, and co-workers. A powerful source of strength we sometimes forget to use is our own personal power.

Positive affirmations are strong positive statements we make to others and ourselves, or hear others say. They help us tap our internal power and focus on the positive use of that power. The use of positive affirmations in the classroom can help students become self-motivated in their work efforts. It also helps build self-esteem and creates the feeling that we have power over events in our lives.

An example of a positive affirmation is, "I have all the information I need to answer these questions." It avoids the use of negative words like no, can't, don't, and won't, which tap negative energy rather than positive energy. Positive energy affirmations empower us by focusing on our strengths to manage our weaknesses.

Many successful people have revealed their ability to create a mental picture of success; this is helpful in creating a positive affirmation. Teachers who encourage the use of positive affirmations are going a long way towards ensuring that they will have a group of happy, successful, highly motivated students who are eager to come to class and will enjoy and benefit from the learning process.

Quiz Answers

1. Birds of a feather flock together.
2. Cleanliness is next to godliness.
3. Beauty is skin deep.
4. You can't teach on old dog new tricks.
5. Don't cry over spilled milk.
6. All that glitters is not gold.
7. Where there's smoke, there's fire.
8. Beggars can't be choosers.
9. Goodness is its own reward.
10. People who live in glass houses shouldn't throw stones. 73

Please send write-ups on interesting classes, recruiting ideas, youth club activities, or individual children's experiences along with photos, to Carole Perry at the above address.

Photo A. Good motivation is the key to happy, learning students. In the ham class as well as in the school classroom, be sure to provide an environment that encourages risk-taking and success.

Photo B. A good teacher makes sure every student has the opportunities for challenge and success.

HOMING IN *Continued from page 60*

and DX clubs in the USA, the JAs have organizations devoted to foxhunting.

Commercial RDF gear is plentiful and popular. Typical hand-held units for 2 meters feature a 2-element phased array beam, similar to the HB9CV array found in HF DX stations. This array is smaller than a yagi, which makes it excellent for romping through the brush.

The receiver, built into the short boom, is synthesized to cover 144 to 146 MHz. It detects both AM and FM, and is very sensitive. An S-meter and electronic attenuator are included, giving contestants the ability to estimate distance to the fox. One model features an audio S-meter in one channel of stereo headphones, and receiver audio in the other channel.

You ask, "Why aren't these state-of-the-art sets exported to the USA?" Good question—I'd like to know, too. With a slight modification, they would cover the full US 2 meter band. Perhaps US importers don't think that T-hunters here will buy enough of them to cover the high cost of FCC receiver certification. What do you think?

In addition to on-foot radio races, Japanese hams are discovering mobile T-hunts. World-class T-finder Yoshiko Yamagami JQ1LCW sent pictures of a June 1991 nighttime event. Yagis were the most popular RDF antennas (Photo C), with some ingenious methods of mounting and turning.

Yoshiko says her club holds a hunt every two months, with a two-hour time limit. It's common to see 20 to 30 vehicles competing. The Japanese are strong supporters of national and international events. The All-JA-DF competition for 1991 was held in October near Mt. Fuji. JA hams have participated in the Friendship Radio Games and the All-China RDF Contest.

Your Turn

What is your club doing about RDF, for sport or more serious purposes? Send me your T-hunt news and photos to share with "Homing In" readers. If your club's newsletter reports on T-hunting, how about putting me on the mailing list?

You say there is no hunting in your area? Well, your assignment for next month is to start one. Just talk it up and you will probably be surprised at the response.

Kevin Kelly N6QAB, an intrepid Southern California T-hunter, moved to Albuquerque some months back and found no radiosporting activity. After a bit of jawboning and demonstrating, an active hunting crew developed. You can now find a 2 meter mobile hunt there almost any weekend.

So now it's your turn. I expect a full report. 73

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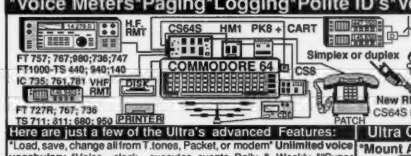

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Microwave PLL Bricks

It's the end of the year, and I'm thinking about all the projects I've done. Several of them are still in the mill for improvements, and, considering my basic personality, probably will be forever. I'm still working on the laser communications projects and improving my microwave station for 6 and 10 GHz. Recently they had to take a back seat to other items, particularly vacations and family matters which, of course, take priority.

This month we will wrap up phase-locked brick oscillators for some time, at least until a better device becomes available in surplus. The brick oscillator, in my estimation, is the best single local oscillator. It has promoted interest in microwave, as it is easy to modify to amateur frequencies by retuning the output filter. Once retuned, you have a high precision that's easy to maintain. Accuracy is something in the order of a few kHz at 10 GHz for a stand-alone unit. Long-term (a month or so) stability runs from 20 to 40 kHz.

Where do you get a brick? Check your local swap meets and flea markets. You never know when one might turn up. Keep an ear tuned for commercial stations closing down a microwave link. If you're in education, have your school write a letter to the communications authority for possible donations of material. It's worth a shot.

As to the applications the brick oscillator can fill, they are many. Use depends on what frequency brick you can obtain. If you can't locate one, I have a modest quantity of 6 and 10 GHz bricks. These include bricks without the harmonic multiplier assembly. This is the type needed for this month's project. All units I specify have been bench-tested and are functioning.

Constructing the Converter

Although the basic brick is used extensively for the 6 and 10 GHz amateur bands, I verified that it can cover other frequencies, including the 2304 MHz amateur and 1691 MHz weather satellite frequencies. While quite different in application, both frequencies present exciting new domains to explore. It is tough to locate surplus components for these frequencies. What came about was the realization that a 10 GHz brick can work on these frequencies, making it possible to more easily construct a 2304 MHz transverter and a receiver for the 1691 MHz weather satellite service.

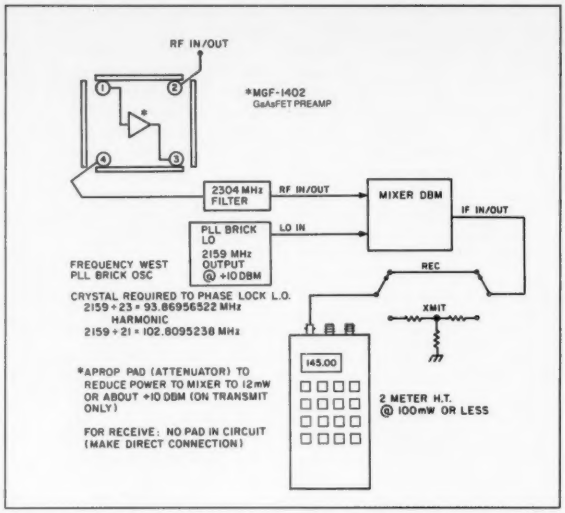
The trick in making a converter is to come up with a simple mixer and RF amplifier. These are not difficult to obtain from standard designs published previously. The local oscillator is what stumps most people on home-construction projects. I would prefer a GaAsFET amplifier with a MGF-1402 device. The mixer is not too difficult to come up with. I designed a home-brew mixer for the 1.3 GHz bands which will also work well at 2.3 GHz. Packaged mixers, such as the Mini Circuits Labs TFM series mixers, are small and cost less than $20 each. Performance is good to 1.5 GHz, which is not bad for a mixer (TFM-5) that is so small you can hide it in a pencil eraser.

The RF amplifiers are not difficult to obtain, either. You can purchase several fully constructed devices. Several GaAsFET amps are available for home-brewing. The ARRL has published excellent designs from both Kent WA5VJB and AL WB5LUA. See Al Ward's article on designs for 2.3–10 GHz in the May 1989 issue of *QST*. Any *ARRL Handbook* from the last few years has some of Kent's GaAsFET designs for 1296 MHz. Look them up; they are what the doctor ordered, and they should be modifiable to work at 1691 MHz.

The main difference between the two converters (apart from frequency) is that the 2304 MHz converter is bi-directional. It will receive as well as transmit, with relay switching used to turn the preamplifier around for transmit. This amplifier will not deliver rock-crushing levels, but it will provide a good 10 to 15 dB gain from the mixer. See Figure 1 for block diagrams of both systems.

The Weather Receiver

The weather satellite converter output is connected directly to a 137 MHz VHF weather receiver. In the 2304 MHz version, the receive circuitry is essentially the same except for relay switching. In transmit, the transfer relay reverses the preamplifier to make it a transmit amplifier. An attenuator is switched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2 METER H.T. @ 100mW OR LESS
FOR RECEIVE: NO PAD IN CIRCUIT (MAKE DIRECT CONNECTION)

Figure 1. 2304 MHz transmit receive converter using building block method of construction.

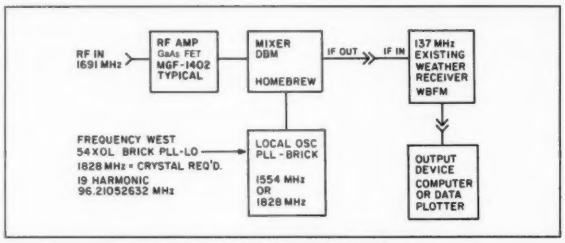

Figure 2. 1691 MHz weather receiver.

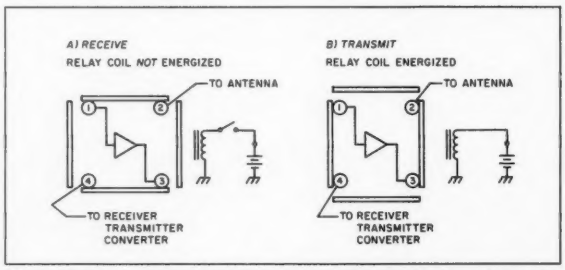

Figure 3. Coaxial transfer relay. Four-coax connector relay with the unique ability to reverse the transmission of an amplifier used non-energized for receive and energized for transmit gain.

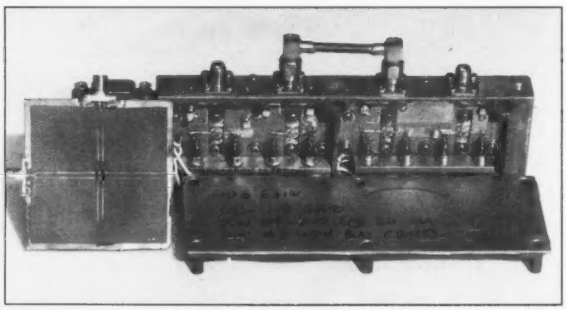

Photo A. 1691 MHz RF amplifier used in tests. This was a surplus 4-stage block amplifier with a 3 dB noise figure and 40 dB gain over 1.26–1.96 GHz. The square PC board is the home-brew mixer used for 1–2.5 GHz operation. Reference Figure 2.

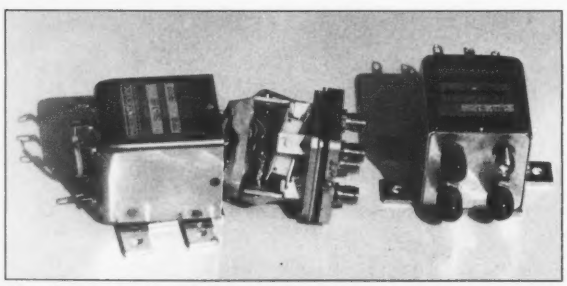

Photo B. Example of transfer relay. The left unit has been opened for clarity. Only one rocker (actuator for relay shown) transfer relay uses two rocker arms on either side of the relay coil to affect 4-port switching used for "transfer operation." See Figure 3 for details.

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into the transmit path to reduce drive to a level suitable for the mixer. The maximum power needed to drive the mixer is typically +10 dBm, or about 12 milliwatts of RF. When switching is complete, the transmitter can be activated. This will produce output on 2304 MHz, FM or SSB operation.

Converters, transverters—they are all the same, no matter what frequency they are for. Usually a high frequency is heterodyned to a lower frequency for processing. The addition of filters and other switching simplify the total operation towards a one-switch operation. Timing or sequencer circuits are added to ensure proper relay operation.

Relay switching can be done manually if you choose. My station operates in the manual mode and works well. It might not be full of frills, but what's important is that it works. It just depends on how far you want to go with your project, and what you want to spend on it.

Crystal Multiplier Construction

Now comes the local oscillator. In most designs this is a crystal multiplier that needs to be constructed due to a lack of commercial equipment for 1691 and 2304 MHz. Now, I am not a lazy person, but when an easy way is available, I make use of it. This initially caused some head scratching until it became apparent that the old 10 GHz bricks are usable with minor modifications.

Last month you learned how to convert the output filter of this same brick. In this application, the filter and SRD diode multiplier are removed. Now the fundamental high power local oscillator is the LO output. I don't know why I didn't think of this before.

The operation is quite simple. The 10 GHz bricks have a high power oscillator that normally runs in the 1700 to 2000 MHz range. The 6 GHz brick's cavity oscillator runs from 1200 to 1400 MHz, making various applications possible. Take a basic 10 GHz brick (LO 1.7–2 GHz) and remove the microwave varactor multiplier and filter. This gives you direct access to the high power LO. This unit is directly under the blue label for Frequency West bricks.

Next, change the length of the cavity screw for the frequency desired. With the cavity screw seated deeper in the cavity, the frequency will be higher. Place a coaxial probe mounted on a small adapter plate over the LO high power output port. This hole was previously occupied by the varactor multiplier's RF probe. By changing the cavity length, it is then possible to make the oscillator phase-lock to frequencies as high as 2.4 GHz, making 2.159 GHz very easy to reach. This allows a 2 meter IF at 145 MHz to mix with the LO at 2159 MHz, producing 2304 MHz (or 2.304 GHz). This is the high side mix product.

For the weather satellite receiver using a system IF at 137 MHz, the LO required would be 1554 MHz (low side injection) and 1828 MHz for high side injection. I have not tried the low frequency operation at 1554 MHz, but suspect it might be possible. I am not familiar with the FM format for the weather data, but I believe high or LO side mix can work well. I am an RF person, and have never tried to receive weather data, but I will get the design worked out OK.

The crystal required for use in the brick is a high accuracy oven-controlled overtone crystal. I obtained my crystal from International Crystal Co. in Oklahoma, part number #585132 for the Frequency West brick oscillator type 54XOL. The crystals costs about $20 each. Crystal frequency can vary from 95 to 108 MHz at the frequency of oscillation. The crystals 17th to 19th harmonics are used to lock the cavity oscillator to the desired output frequency. Higher harmonics are available such as the 21st or 23rd making phase lock at 2159 MHz with a 102.8095238 MHz crystal. Using a lower harmonic would make the crystal frequency quite high and put it out of the 90 to 108 MHz range specified.

As I stated earlier, I have picked up a quantity of the 10 GHz phase-locked brick oscillators with and without the multipliers. The full 10 GHz brick with multiplier and retuned for the amateur band is $65. The basic brick without filter for the weather satellite or 2304 MHz service is $50. All prices are postpaid for U.S. destinations.

For further information on these brick oscillators, check out the many different applications covered in previous *73* articles. For temperature control and typical internal crystal oscillators, see the June and July 1990 columns. For details, including diagrams, on the 6 GHz brick, see the September 1990 column. The 10 GHz brick system was covered in the December 1989 column.

Mail Box Comments

Blair VE6AHG saw the column covering the FET Switcher (power supply) in the August 1990 issue. He has an old WWII Navy transmitter (TBW-5) he is restoring, and ran into a snag. The input power transformer is rated at 800 Hz AC input, and the switcher used to convert 12 volts DC to 110 AC is at the frequency of choice. The FET Switcher should work well. With several FETs in parallel, Blair should be able to increase current demands. The FETs are hooked up element-to-element without current equalization resistors. Use a heat sink and place transient protection from drain to ground. This transient network is a 0.1 µF capacitor and 5 ohm resistor tied in series to ground from each drain.

Jim WA9PYH saw his response for information on stripline filters in this column, and wants to say thanks for the 1296 LO PC board designed by Paul Schuch. He was going to make a copy of the artwork to try the 1296 MHz filter circuitry on the board. Jim was going to convert the filters to 1691 MHz for use with a weather satellite converter. I kind of upset his plans, as I sent a fully etched PC board with my reply. It was the same one he was going to make. Jim wrote back, "Thanks a lot! See how nice hams are. They are interested in technology and want to learn." Thanks, Jim, for the kind words.

Supplying the PC board is not only a way to answer your question, but to give your project a boost. Glad I could help out. I make my own PC boards, using the silk screen method. Once the screen is complete for a particular project, a PC board can be zipped off in no time. I have to give thanks to Paul Schuch for designing the PC board. His article for the 1296 MHz LO appeared in the December 1979 issue of *Ham Radio*.

I'll be glad to answer questions relating to the VHF/UHF microwave areas of interest. Please include an SASE. 73 Chuck WB6IGP 73

Number 26 on your Feedback card

SPECIAL EVENTS

Ham Doings Around the World

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the January issue, we should receive it by October 31. Provide a clear, concise summary of the essential details about your Special Event. Check /HAMFESTS on our BBS (603–525–4438) for listings that were too late to get into publication.

DEC 1

PASADENA, CA The Toys for Tots Ham Radio Rally will be held at the world famous Rose Bowl from 11 AM–4 PM, to raise toys for underprivileged children in the Los Angeles area. All you have to do is bring a new toy valued at $5 or more to parking Lot 1, just south of the Rose Bowl. All toys will be collected by the US Marine Corp Reserves. Other scheduled events are the Ham Radio Installation Concours; ham mobile rig judging for neatness of installation, inventiveness, largest number of rigs and antennas. Judging begins at 3 PM. Talk-in on 145.180–. For info call ***Bruce N6TFS, (213) 257–5502, Packet: N6TFS @ N6YN.***

HAZEL PARK, MI The Hazel Park ARC will hold its 26th annual Swap and Shop at the Hazel Park High School from 8 AM–2 PM. Admission $3 advance or at the door. Tables $12 (reservations must be received with check, no reservations by phone!). Free parking. Talk-in on 146.64– (DART). Send table and ticket reservations to ***HPARC, PO Box 368, Hazel Park MI 48030.***

DEC 7

DOTHAN, AL The Wiregrass ARC will hold a Hamfest from 8 AM-3 PM at the Wiregrass Memorial Park. Set-up from 7–8 AM. Free admission. Tables with power $7.50; without power $5. Tailgating $2.50. Concessions available on site. ATNM and Packet Forums. VEC FCC Exams on site. Talk-in on 147.340/.940. Contact ***N4RNU, 1811 West Main St., Dothan AL 36301*** for info and reservations.

FARIBAULT, MN The annual Courage Center Handi-Ham Winter Hamfest will be held at the Eagles Club in Faribault, starting with registration at 8:30 AM. There will be a handi-ham equipment auction, VE exams, dinner at noon, and program. Talk-in on 146.19/.79 Contact ***Don Franz W0FIT, 1114 Frank Ave., Albert Lea MN 56007.***

DEC 8

LARGO, MD The Goddard ARC and the Tri-County ARC will co-sponsor Holidayfest '91 to benefit Prince George's County RACES/ARES, from 8 AM–4 PM, at the Prince George's Community College Student Union Bldg. (Exit 15A or 17A Capital Beltway). There will be symposiums on Emergency Management, Antennas, AMSAT, Packet Radio, and SKYWARN. Meteorologist Doug Hill will present a Weather symposium. Free VEC Exams will be administered by the LARC VECs throughout the day. A special CW Speed Challenge contest will also be featured. Donation $4. Unlicensed spouses and children under 12 admitted free. Tailgating (weather permitting) $5. Tables are $18 till Nov. 23rd, $22 at the door (if available). Each table includes one paid donation. Plenty of free hard surface parking. Talk-in on 147.180+, 145.73 simplex, 146.835–, 444.65+. For reservations, send payment and SASE to ***Tri-Co/Goddard Holidayfest, 360 Domer Ave., Mail-Drop 120, Laurel MD 20707. (301) 572–2326.***

DEC 14

NORFOLK, VA PC Fest Computer Shows will sponsor an event at the Norfolk Scope Convention Center from 10 AM–4 PM. Admission is $6 for adults, children under 10 admitted free. For info contact ***Shows, Inc., (407) 241–1660.***

DEC 28

GAITHERSBURG, MD PC Fest Computer Shows will host an event at the Montgomery County Fairgrounds from 10 AM–4 PM. Admission $6, children under 10 admitted free. Contact ***Shows, Inc., PO Box 832049, Delray Beach FL 33483. (407) 241–1660.***

DEC 29

SOUTH BEND, IN The Repeater Valley Hamfest Committee will hold a Hamfest Swap & Shop at Century Center, Downtown on US 33 ONEWAY North between the Society Bank Bldg. and the river in South Bend. Four lane highways to the door from all directions. Tables $5/5' round; $15/8 x 2.5' rectangular; $20/8'. Wall locations. Talk-in on 52/52, 99/39, 69/09, 34/94, 145.29. Contact ***Wayne Werts K9IXU, 1889 Riverside Dr., South Bend IN 46616,*** or phone ***(219) 233–5307.***

SPECIAL EVENT STATIONS

DEC

SYDNEY, NOVA SCOTIA The Marconi Amateur Wireless Society of Sydney, Nova Scotia, will operate Station VA1S during the month of December, 1991, to commemorate the 89th Anniversary of Marconi's first successful West to East trans-Atlantic radio transmission on Dec. 15, 1902, from Glace Bay, Nova Scotia to Poldhu, Cornwall, England. An attractive certificate suitable for framing is available to confirm contact with VA1S. Send $3 or 5 IRCs to ***Alan Leith VE1AL, 846 George St., Sydney, Nova Scotia, Canada B1P 1L9.***

DEC 1

ROSE BOWL, PASADENA, CA The Toys for Tots Ham Radio Rally will operate KA6RJF from 1900Z–2400Z on Dec. 1 to commemorate the first annual Toys for Tots Ham Radio Rally charity event. Operation will be SSB in the General 40 m and 20 m and the Novice 10 m subbands. For a certificate, send a QSL and a 9 x 12 SASE to ***KA6RJF, 1302 Mar Vista, Pasadena CA 91104.***

DEC 7–8

PEARL HARBOR, HI Region Eight, Navy-Marine Corps MARS will operate KH6SP, NNN0 and NNN0ARZ, 0400Z Dec. 7–0400Z Dec 8, from Ford Island adjacent to the Arizona Memorial, to commemorate the 50th Anniversary of the Pearl Harbor attack and the sinking of the USS Arizona. Amateur operation will be in the lower portion of the General phone bands, AMTOR and RTTY in subbands. MARS operations will be announced separately. For QSL, send your QSL card and an SASE to ***KB4JI/KH6, 106 Ford Island, Honolulu HI 96818.***

HONOLULU, HI A group of Hawaiian hams will operate a Special Event Station to commemorate the 50th Anniversary of the attack on Pearl Harbor. Operation will be 1700Z Dec. 7–1700Z Dec. 8. Frequencies: Activities are planned for all bands, all modes, including Novice subbands. Look for us at the lower portion of each subband. For a QSL certificate, please send your QSL card, 6 IRCs or equivalent, and a 9 x 12 SASE to ***Pearl Harbor Special Event, PO Box 788, Wahiawa HI 96786.***

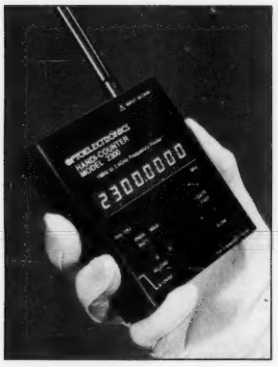
DEC 28–JAN 1

PASADENA, CA The Relay Repeater ARC will operate AA6YL from the Wrigley Mansion in Pasadena, to commemorate the 103rd Anniversary of the Tournament Of Roses; 103 years of the Rose Parade, and 78 years of the Rose Bowl Game. The station will operate from 1600Z–0400Z each day on the following frequencies: 14.260, 21.335 and 28.450. Amateurs in California/Nevada can contact the station on 2 meters via the Club repeater 144.970/147.410, on 147.21+, or on 220 meters via the Condor Connection. For certificate, send QSL and 9 x 12 SASE (58 cents) to ***Relay Repeater Club, PO Box 81, Arcadia CA 91066.***

Number 27 on your Feedback card

NEW PRODUCTS

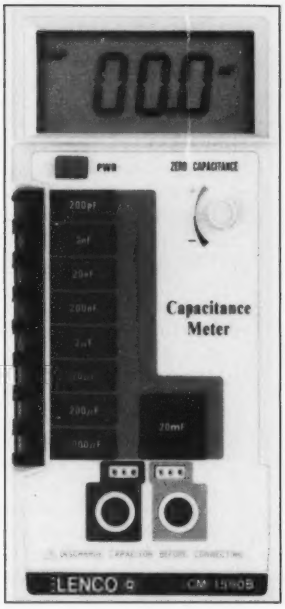
Compiled by Hope Currier



OPTOELECTRONICS

Optoelectronics Inc. has announced a new frequency detector/counter, the Handi-Counter Model 2300, for use in secure installations, countersurveillance and police tactical situations, private investigations, two-way radio, ham radio, frequency monitoring and other applications where a dedicated frequency counter is usually too costly. The Model 2300 features full eight-place readout resolution, 10 mV sensitivity for signal detection at maximum distance from the transmitter, and a unique and convenient display-hold switch so the user won't have to remember or write down the detected frequency.

The Model 2300 is priced at $99. There is an optional NiCd battery pack available for $29. For more information, contact *Optoelectronics Inc., 5821 NE 14th Avenue, Fort Lauderdale FL 33334; (305) 771–2050, (800) 327–5912, FAX: (305) 771–2052.* Or circle Reader Service No. 201.



ELENCO ELECTRONICS

Elenco Electronics has introduced a new series of digital hand-held multimeters that have an extra-large, easy-to-read, three-quarter LCD display, perfect for engineers, technicians or hobbyists. The CM-1500B multimeter and CM-1550B capacitance meter have a one-half percent accuracy rate. The CM-1500B measures AC/DC volts; AC/DC current to 20 amps; and resistance, transistors, diodes, capacitors to 20 µF as well as conductance. The CM-1550B measures capacitance from 0.1 pF to 20,000 µF. Both meters have side push-button switches, and the CM-1550B has a zero control.

Both meters include Elenco's two-year warranty, test leads, operator manual, and a carrying case at no additional charge. Prices are $75 for the CM-1500B, and $79.95 for the CM-1550B. For more information, contact *Elenco Electronics, Inc., 150 West Carpenter Ave., Wheeling IL 60090; (708) 541–3800, FAX: (708) 520–0085.* Or circle Reader Service No. 203.

RADIO SHACK

The Realistic® HTX-202 2m synthesized VHF-FM HT comes with a large-capacity NiCd battery pack/charger, a multifunction scanning system, 12 independently programmable memory channels (plus one calling and three priority memory channels), a built-in subaudible tone encoder and tone squelch, a touch-tone (DTMF) memory dialer and DTMF squelch. The highly selective receiver fights intermod and front-end overload. True FM transmit gives superior clarity on voice and outstanding performance on packet. An alkaline battery case, belt clip, charger and rubber ducky antenna are included.

The suggested retail price for the HTX-202 is $260. For the address of a local dealer, contact *Radio Shack, 700 One Tandy Center, Fort Worth TX 76102; (817) 390–3300.* Or circle Reader Service No. 202.

QUICK-N-EASY DXCC

DXCC COUNTRY, PREFIX, AND BEAM HEADING LIST
BEAM HEADINGS CENTERED ON WASHINGTON, D.C.

PFX	COUNTRY	HEADING
A1	ABU AZ	60
A2	BOTSWANA	103
A3	TONGA	264
A4	OMAN	62
A5	BHUTAN	13
A6	UNITED ARAB EM	66
A7	QATAR	66
A9	BAHRAIN	66
AP	PAKISTAN	34
BV	TAIWAN	342
BY	CHINA	360
C2	NAURU	297
C3	ANDORRA	59
C5	THE GAMBIA	98
C6	BAHAMAS	182
C9	MOZAMBIQUE	100
CE	CHILE	179
CE0	ANTARCTICA	188
CE0	EASTER ISLAND	310
CE0	SAN FELIX	183
CE0	JUAN FERNANDEZ	182
CO	CUBA	190
CN	MOROCCO	72
CP	BOLIVIA	170
CT	PORTUGAL	67
CT3	MADEIRA ISLAND	78
CU	AZORES	78
CV	URUGUAY	163
CY9	ST PAUL IS	53
CY0	SABLE IS	63
D2	ANGOLA	97
D4	CAPE VERDE	102
D6	COMOROS	90
DL	GERMANY	68
DU	PHILIPPINES	339
EA	SPAIN	63
EA6	BALEARIC IS	61
EA8	CANARY IS	81
EA9	CUETA/MELILLA	69
EL	LIBERIA	100
EP	IRAN	39
ET	ETHIOPIA	86
F	FRANCE	53
FB8W	CROZET	118
FB8X	KERGUELEN	139
FB8Z	AMSTERDAM	98
FG	GUADELOUPE	146
FJ	SAINT MARTIN	146
FH	MAYOTTE	90
FK	N. CLADONIA	247
FM	MARTINIQUE	146
FO	CLIPPERTON	234
FO	FR. POLYNESIA	262
FP	ST. PIERE/MIQ	56
FR/G	GLORIOSO IS	77
FR/J	JUAN DE NOVA	80
FR	REUNION	80
FR/T	TROMELIN	76
FW	WALLIS/FUTUNA	265
FY	FR GUIANA	140
G	ENGLAND	49
GD	ISLE OF MAN	47
GI	NORTH IRELAND	47
GJ	JERSEY	53
GM	SCOTLAND	48
GU	GUERNSEY	52
GW	WALES	50
H4	SOLOMON IS	284
HA	HUNGARY	67
HB	SWITZERLAND	63
HB0	LIECHTENSTEIN	61
HC	ECUADOR	182
HC8	GALAPAGOS IS	201
HH	HAITI	167
HI	DOMINICAN REP	161
HK	COLOMBIA	178
HKO	MALPELO	187
HKO	SAN ANDRES/AL	190
HL	KOREA	341
HP	PANAMA	188
HR	HONDURAS	360
HS	THAILAND	344
HV	VATICAN	58
HZ	SAUDI ARABIA	66
I	ITALY	55
IS0	SARDINIA	59
J2	DJIBOUTI	81
J3	GRENADA	149
J5	GUINEA-BISSAU	99
J6	ST LUCIA	146
J7	DOMINICA	148
J8	ST VINCENT	147
JA	JAPAN	351
JD1	MINAMI TOR	314
JD1	OGASAWARA	326
JT	MONGOLIA	357
JW	SVALBARD	14
JX	JAN MAYEN	28
JY	JORDAN	63
K	USA	273
KC4	BELAU	299
KG4	GUANTANAMO BAY	178
KH1	BAKER/HOWLAND	276
KH2	GUAM	314
KH3	JOHNSTON IS	284
KH4	MIDWAY IS	298
KH5	PALMYRA/JARVIS	273
KH6/C	KINGMAN REEF	273
KH6	HAWAII	282
KH7	KURE ISLAND	299
KH8	AMERICAN SAMOA	261
KH9	WAKE ISLAND	282
KH0	MARIANA IS	312
KL7	ALASKA	323
KP1	NAVASSA	178
KP2	VIRGIN IS	149
KP4	PUERTO RICO	162
KP5	DESECHEO IS	158
LA	NORWAY	57
LU	ARGENTINA	164
LX	LUXEMBOURG	60
LZ	BULGARIA	80
OA	PERU	180
OD	LEBANON	60
OE	AUSTRIA	48
OF	FINLAND	23
OH0	ALAND ISLAND	36
OJ0	MARKET REEF	36
OK	CZECHOSLOVAKIA	47
ON	BELGIUM	52
OX	GREENLAND	33
OY	FAROE ISLAND	37
OZ	DENMARK	41
P2	PAP NEW GUINEA	268
P4	ARUBA	145
PA	NETHERLANDS	57
PJ2	NETH. ANTILLES	163
PJ8	ST MAARTEN	148
PY	BRAZIL	147
PY0	FERNANDO DE NOR	128
PY0	ST PETE/PAUL ROCK	119
PY0	TRINIDADE/MART	129
PZ	SURINAME	144
S2	BANGLADESH	13
S7	SEYCHELLES	84
S9	SAO TOME/PRINC	94
SO	WESTERN SAHARA	93

MILESTONE TECHNOLOGIES

CODEMASTER Version 4.0 is a new version of Milestone Technologies' Morse code training program. This upgrade incorporates changes requested by customers, especially in the area of the user interface, taking advantage of the latest compiler and processor technology. It significantly enhances user control of the program, offering a new routine for changing and saving program settings, improved performance, and a higher level of error checking.

The price hasn't gone up—the new version is still $19.95. Contact *Milestone Technologies, 3551 S. Monaco Parkway, Suite 223, Denver CO 80237-1228; (303) 752–3382.* Or circle Reader Service No. 205.

FB ENTERPRISES

FBenterprises is offering a set of handy reference cards for hams. "Quick-N-Easy 2m Repeater Maps" are maps of your state, including an up-to-date list of 2m repeaters. The back of the card lists 220, 440, and 900 MHz, and 1.2 GHz repeaters in the state. These cards are easy-to-read, and great for travel. The "Quick-N-Easy DXCC" card (see photo) has a listing of all DXCC countries, along with their most common prefix, and the beam heading from your location. "Quick-N-Easy QSO Helper!" lists the RST system, Q signals, UTC time conversion, Fahrenheit-to-Celsius temperature conversion, and feet-to-meters conversion. "Quick-N-Easy Shortwave Listening" is a series of four cards for shortwave listeners. Each card shows six hours of the day with listings for shortwave broadcast stations. The "QSL Kit" is a package containing everything needed for QSLing DX stations via the bureau, including envelopes, addresses for each bureau, and instructions on how to use the bureau.

The cards retail for $4.95 each; the QSL kit is $1.99. Dealer inquiries are welcome. Contact *FBenterprises, 8818 Rainier Dr., Vancouver WA 98664; (206) 695–3637.* Or circle Reader Service No. 204.

A.W. SPERRY INSTRUMENTS

A.W. Sperry Instruments has announced a new Techmaster digital multimeter, Model DM-8500. This rugged 3-3/4 digit, drop-proof, heavy duty, autoranging DMM can read 12 functions on 37 ranges. Its many features include a fused 20A AC/DC range, overload protection on all ranges, HFE transistor test, logic indicator, peak hold, diode test, safety yellow housing and "auto-off," making the DM-8500 one of the most state-of-the-art digital multimeters available today. It comes complete with one set of test leads (TL-58), one B-4 battery, one F-20 fuse, operating instructions and a warranty card.

The Model DM-8500 is priced at $139.95. For more information, contact *A. W. Sperry Instruments Inc., 245 Marcus Boulevard, Hauppauge NY 11788; (516) 231-7050.* Or circle Reader Service No. 207.

MARCOMP

"Mr. Morse" from MARCOMP, a customized version of a package used by the Canadian Navy, is a user friendly program which uses hypertext technology, pull-down menus, windows, dialogue boxes and selection buttons. The program is divided into two modes of operation: Learning Mode for beginners, where the characters and their symbols can be displayed while transmitting; and Training Mode for continuous training for advanced users. The Receiving Module is $39.95, the Transmitting Module (added) is $24.95, both modules together are $59.95, and a kit for interfacing an actual Morse key to the user's computer is $129.95. All prices are Canadian dollars; taxes and shipping not included. Contact *MARCOMP, #402-130 Keith Road West, North Vancouver, B.C., Canada V7M 1L5; (604) 980-5718, FAX: (604) 988-6455.* Or circle Reader Service No. 206.

THE RADIO WORKS

Catalog #912 from The Radio Works, an 80-page source book of wire antenna systems, parts and accessories, is now available free to *73* readers (for extra-fast delivery, send $2 for first-class postage). It includes a complete selection of coax, connectors, and antenna wire—everything for the wire antenna wire enthusiast. A full array of complete antenna systems like the Carolina Windom, "G5RV Ultra" and SuperLoop are featured. New in this issue is a line of isolators made specifically for vertical antennas, plus the 80–10m Carolina beam and the 40–10m Carolina Beam/2. Everything you need to accessorize or update your present antenna system is in this catalog, all at discount prices.

To order your copy, contact *The Radio Works, Box 6159, Portsmouth VA 23703; (804) 484-0140, FAX: (804) 483-1873.* (Mention *73*.) Or circle Reader Service No. 211.

CCTV CORP

CCTV Corporation has introduced the "GBC" CCD-300 micro-miniature solid-state CCD camera, a vidicon camera replacement, ideal for all CCTV needs. The camera uses a unique micro-electronic shutter that allows the sensor itself to compensate for all light changes, therefore eliminating the need for an auto-iris lens. The CCD-300 can use both "C" and "CS" type lenses. It operates from low voltage (7–12V DC) and comes standard with a 120V AC to low voltage DC power module. Full video can be achieved with light levels as low as 2 lux. The camera offers resolution in excess of 350 lines, plus standard features such as adjustable gamma, auto black level, a built-in image enhancer, mirror image reversal and switchable auto/manual gain.

The CCD-300 is priced at $229.50 for *73* readers. Contact *CCTV Corp., 315 Hudson Street, New York NY 10013; (212) 989-4433, (800) 221-2240, FAX: (212) 463-9758.* Or circle Reader Service No. 210.

POLYPHASER

A video tutorial, "Grounding—An Overview," is now available from Polyphaser and its distributors for $49.95. The video, approximately 60 minutes long, provides extensive information on the latest grounding techniques for communication site protection from lightning. Future videos will cover more site-selective installations, such as high-rise buildings and mountain top locations.

For more information, contact *PolyPhaser Corporation, Customer Service Department, P.O. Box 9000, Minden NV 89423-9000; (702) 782-2511, (800) 325-7170, FAX: (702) 782-4476.* Or circle Reader Service No. 208.

OWENS/BROWNING SOFTWARE

CW Simulator software from Owens/Browning Software includes Morse code training features that ham radio operators have requested: adjustable code speed and tone; beginning lesson menu; display in groups, lines and characters; "Hide and Seek" text option; letters, numbers, punctuation and Q signals; random character and callsign generator; and standard and Farnsworth modes. It has a QSO generator capable of over 700 billion combinations (users can edit and create new text); a screen editor to create, save and play back user-created QSOs and messages; a plaintext generator for three-, four- and five-letter words; and the ability to calibrate software code speed to the PC clock. The program offers on-the-air simulation, teaching the operator to copy through QRM and poor operator rhythm.

CW Simulator is available on 3.5″ and 5.25″ diskettes, for $24.95 each. Contact *Owens/Browning Software, 954 Church St., Hutchinson MN 55350.* Or circle Reader Service No. 209.

COYNE CO.

MacHam™ software programs from the Coyne Co. are test generator/study aids for getting a no-code Technician class ham license, and for upgrading. "MacHam Technician" contains all 700 possible FCC questions for the code-free Technician test, covering both elements 2-Novice and 3A-Technician. The MacHam programs for upgrades cover all possible questions from elements 3B-General, 4A-Advanced and 4B-Extra, respectively. Each program will generate FCC-style exams and any number of unique tests are possible. Exams can be taken on-screen or in printed form. An on-line glossary of key terms is included. Hardware requirements: any MacIntosh computer, Mac Plus or newer; 2MB RAM and a hard drive; and a Macintosh-compatible printer.

The suggested retail price for MacHam Technician is $49.95; MacHam General, Advanced and Extra are $34.95 each. Prices include shipping. Contact *Coyne Co., P.O. Box 2000-200, Mission Viejo CA 92692; (714) 855-4689.* Or circle Reader Service No. 212.

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1-708-540-1106

CIRCLE 185 ON READER SERVICE CARD

WATTMETER

TS-118A WATTMETER measures RF power over 20-1400 MHz in ranges 20-100 (300 W max), 100-300 (500 W), 300-700 (250 W), and 700-1400 MHz (125 W). Meter shows voltage developed and reading is translated into RF watts on calibration chart. SWR < 1.25:1. With four thermocouples, tuning shunt, LC to N adapter and transit case. 8.5x6x20.5, 48 lbs sh. Used . . . **$149.50**

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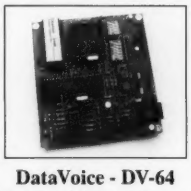

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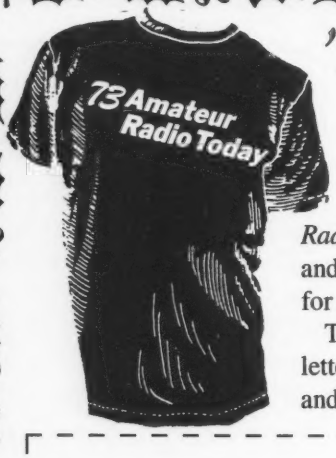

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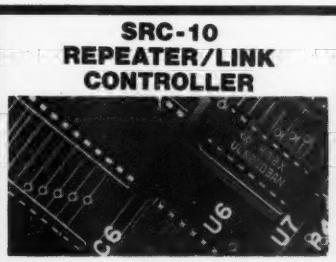

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More Gain

Before we continue our discussion of gain, I'd like to sidetrack a little and discuss a topic which may surprise you. In the three years I've been writing this column, we've covered just about every component used in modern radio gear, right? Well, there's one we've overlooked, and I was reminded of its importance by a problem I had with my TS-940.

I've had the rig for about five years, and never noticed anything wrong. Recently, though, I was fooling around with it while it was connected to my dummy load, and I discovered that the "high cut" control, which narrows the high side of the receive passband, was affecting my transmit audio as well!

The '940 has an IF monitor function which lets you listen to your actual transmit signal. Sure enough, my voice was being severely muffled in transmit whenever the high cut control was turned toward the narrow side. Even weirder, the problem only occurred when I was in LSB; in USB, the rig behaved perfectly normally! What was going on here?

Up with the Scope

Naturally, I dug out my oscilloscope and started probing. Luckily, I have the service manual for the radio, so I knew where to look. Actually, I needn't have bothered with the scope. In fact, I could have left the rig's covers on; a little deduction was all that was really required. Let's look at the facts here: Everything works fine in receive, where the control is supposed to function. It is properly locked out in transmit as long as the radio is set to USB. A look at the service manual reveals that the high cut control functions by the microprocessor's reading the position of the knob and sending data to the PLL, which then shifts an oscillator in order to shift the signal around within the SSB filter's passband. If all this stuff works, then how could it be broken only in LSB? The answer is: It isn't! The rig is shifting the PLL when it shouldn't because *the software is telling it to!*

Does Software Break?

You got it, it was defective software. Today's radios, which are virtually all microprocessor-driven, depend upon their system software to control most functions. A defect or bug in that software can make the radio seem broken, and in effect, it is. Yes, software is a component after all! Don't overlook it as a suspect, especially in obscure cases like this one, where nearly everything works and the pieces of the puzzle just don't add up.

Thanks, Guys

Kenwood was unaware of any bugs in the TS-940 operating system, but they suggested that the EPROM (which holds the software) in my rig could be defective. Although EPROMs don't fail that way (in the rare event of failure, they go completely), it occurred to me that mine could have glitched a few bytes during its factory programming. In any event, a new EPROM from the nice folks at Kenwood fixed the whole thing up. Case closed!

Gaining on Us

Let's continue our discussion of gain. We've seen what it is and why we do it. So what's the big deal, right? We know how to make amplifiers by the barrelful. But not so fast. If you've ever built an amplifier stage, you know that its gain drops off with increasing signal frequency. Audio amps are completely useless at RF. Why should that be?

The answer is: capacitance. Any time you have a voltage potential across any two circuit elements which are near each other, those two elements will exhibit capacitance along with their other properties (such as inductance, resistance, etc.). Unfortunately, this essential fact of life extends even to electrodes in a tube or layers in a semiconductor.

Thus, transistors, diodes, or any parts for that matter, have capacitance between their leads. In other words, they store charges. The result is that they have speed limits beyond which those internal capacitors cannot charge and discharge fast enough. The result is that there are numerous little low-pass filters all over the circuit. Every circuit has them. And, if you recall, the impedance of a given capacitance value goes down as the frequency goes up.

So, as the intended signals rise into the RF range, those tiny capacitances, which have little or no effect on audio signals, start to short out the RF signals you want. The result: The gain drops off until there is none left. In fact, you wind up with *less* signal at the output than you fed in! This is called negative gain, but really, it is *loss*.

Two Ways Out

There are two ways out of this situation, and each has its place. The first is obvious: Reduce the stray capacitances until they are low enough that they don't cause trouble. It works—to a point. Especially with small signal amplifiers, gain devices (transistors, ICs and tubes) are available that have been designed to have very low capacitance. They make nice RF amps up to and beyond 30 MHz.

The other solution is to make the existing capacitances part of a tuned circuit which resonates at or near the frequencies you want to amplify! Now, that same pesky property is turned to your advantage because, as you surely know, nothing works as well as a tuned circuit! This is precisely the technique used in the final amps of rigs with tube finals, and a few early transistor finals were made that way, too. Now you know where the TUNE and LOAD controls came from—they set the resonant circuit to the frequency you are trying to amplify.

It is possible to make no-tune RF amps. Most solid-state rigs have them, and some tube linear amps use them also. Basically, they are broadband tuned circuits. I know that sounds like an oxymoron, but it can be done. You just use a very low-Q LC (inductive-capacitive) combination with no distinct resonant peaks within the desired passband. As long as you cancel the circuit's internal capacitance with sufficient inductance, it works. In practice, it's a bit harder to do well than it sounds.

More Than Amps

Last month, at the beginning of this exploration, I stated that gain was the foundation for virtually all electronics. We've examined amplifiers, but it takes more than amplifiers to make radios, computers, TVs, etc. Let's look at how gain can be turned to other uses.

You know how placing a microphone too close to a PA speaker causes feedback howl? Well, that's exactly how oscillators work. They're just amplifiers which "hear" their own signals, causing the signal to go around and around. The speed of travel is limited by circuit capacitance, and by deliberate means such as coil-cap, resistor-cap, or crystal resonant circuit elements. If a voltage-tunable capacitor (called a varicap or varactor diode) is used, you've got a VCO (Voltage Controlled Oscillator), which is an important part of most frequency synthesizer schemes.

In order for the oscillator to work, the direction or "phase," of the output must be the same as the input. That's called noninverting gain. When the phase is opposite—when the output goes down as the input goes up, and vice versa—you have inverting gain. An inverted signal cannot reinforce itself at the input, so there can be no perpetuation of the signal. It's a useful technique when you want to *avoid* oscillation in a circuit meant only to amplify.

Open the Gate

Digital gates, from which all computers are built, are amplifiers, too! The foundation of the binary digital technique is that there are only two circuit states: on and off. So, these amplifiers are deliberately designed to have extremely poor linearity! They are always either driven all the way on, or they are off. Actually, the internal construction of a typical digital gate looks remarkably like that of an audio amplifier. Inverting amplifiers are used for inverting functions like inverters, NAND and NOR gates. Noninverting amps are used for AND and OR gates, as well as buffers. By the way, an entire computer can be built from NAND or NOR gates. But it would take an awful lot of them to build a PC clone!

Now, let's look at some letters:

Dear Kaboom,

I have an ICOM 575H 6 and 10 meter radio, and I need an antenna tuner for it. Daiwa makes one, but they only sell it in Europe. Any ideas?

Signed, Out of Tune

Dear Out,

An antenna tuner is a very simple thing. Really, it is just a coil and few variable capacitors. The first thing I'd try is to borrow a small tuner from a friend and try it, even if it isn't made to cover 6 meters. Start with the inductor set for minimum inductance and give it a try, keeping the rig set for low power while tuning the capacitors. The tuner's SWR meter will probably be a bit inaccurate at the higher frequencies, but it should still suffice for relative indications, which is all you need anyway. I'd stay away from big, kilowatt tuners here, because their larger components are likely to have too much stray reactance to work well at 50 MHz. If you can't get it to work, why not build your own tuner? Check the ARRL *Handbook* and other antenna project books for plans. Lots of hams build their own tuners, and you can, too!

Dear Kaboom,

Sometime back you mentioned the KDK FM-2016A 2 meter mobile. I have one with a problem. The transmit frequency is off by 3 kHz on the high side. I've tried adjusting the oscillator trimmer and also the three offset caps, but no luck. What can I do?

Signed, Off and Tired of It

Dear Off,

Yeah, mine's had that problem, too. You need a new crystal, which you can get for a few bucks from any of the crystal houses advertising in the backs of the magazines. If the frequency is off only in the + shift position, replace X2, which is the 13.966 MHz crystal. After you replace it, be sure to set the trimcap for the correct frequency and also to readjust the trimpot next to it by setting the +5 kHz switch on and turning the pot for the correct frequency.

73, and see you all next month. 73

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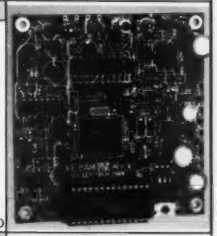

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Never Say Die

Continued from page 4

often exciting. And beating down the pile-ups, hour after hour, is a rush you'll never forget the rest of your life. What does it take to blast you away from the boob tube and your nightly net? Or are you investing the few hours left of your life numbly watching quiz shows, sitcoms and soaps, drinking beer and eating potato chips? Oh, I see those flabby beer bellies hanging out from under your dirty tee shirts and over your belts at hamfests.

Albania was one of the last bastions. One of the rarest of the rare. I forget now how long ago it was that Frank DL7FT/ZA got on the air for a few hours . . . yes, of course I worked him. I think he got permission from a minor official and it took a while for higher officials to overrule the decision and escort Frank back over the border.

But you don't have to go for the #1 needed country. If you just go down to the Caribbean you can find some fairly rare islands which'll guarantee you pile-ups. Visiting these are more a matter of your doing some research and having the initiative. No dangers involved. No pioneering. But one heck of a lot of fun. And if you take some pictures you might get published in *73* by a jealous editor. A very jealous editor.

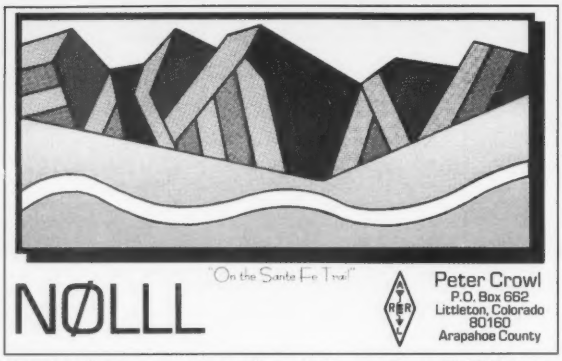
It's been a couple years since I got on from W2NSD/FP8, so I need a DX-pedition fix. I'm definitely antsy. I've got my pictures out from my 7P8 and 3D6 trip . . . sigh. Then I've been invited on a diving trip for next March to New Caledonia. I haven't operated from there in years. I haven't even kept in touch with all my ham friends in Noumea.

What'll it take to get you off dead center and into action? Don't you get excited thinking about it? I suppose I should tell you about when I got on from Nairobi, Beirut, Damascus, the American embassy in Tehran, Kabul, Katmandu, and so on to get your fires warmed up.

I guarantee I'm busier than you, but that doesn't mean I wouldn't drop everything in a minute and head to Albania. The readers who responded to my September editorial asking for help setting up a national rep organization to sell music and music publications will get an idea of the number of projects I've got going. It's such a network of interrelated projects that I think there are only one or two people working for me who understand how it all fits together.

I do my letterhead on my laptop computer because the number of my companies changes every few days. Of course I suppose I come across as a Great Panjandrum as a result. Put it down to the Wizard of Oz syndrome. But yes, I'm busy. Of course, since I retired in 1983 I've been just having fun and I rarely spend much more than half a day "working" . . . 12 to 16 hours, tops. Okay, so where shall we go and raise some hell on the bands?

Let's not forget to take along SSTV. I had it with me at KC4DX, JY9AA and 7P8PA. We'll need packet and OSCAR gear. RTTY? Why not? I had a great time on RTTY from Bangkok not long ago. Are you packed yet? Burma seems to be opening up. When I visited there was no hamming. Ditto when I visited Baghdad, but I'll bet King Hussein could put in a bad word for me and YI2NSD might be able to hit the ground running. Or should I start another magazine instead? I've got this *Secret Guide to FREE Music* I want to get going . . .



QSL of the Month To enter your QSL, mail it in an envelope to *73*, WGE Center, Forest Road, Hancock, NH 03449. Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

The Magic of Communications

Until you are robbed of both the visual and audio cues we're used to getting while talking, you don't realize how important these things are for communications. This, more than anything else, is what causes mike fright. Suddenly we have to talk to someone and we're not getting the cues we've been used to getting all our life. No nods, no eyes to see, not even any uh-huhs to keep us going.

It's no wonder so many of us tend to get into habit patterns, saying essentially the same thing for one contact after another . . . day after day, year after year. What can we talk about? We call a CQ, get a call from someone who gives us nothing more than a callsign. So we have to start off with the basics . . . name, location and signal report. Then we feel we should say something else . . . like what? We don't even know his name yet. So how can we get any kind of a conversation going? The weather? Good grief! How about your rig and antenna? You know he doesn't care any more about that than you do, so why waste your breath?

It's embarrassing to start reading off a list of your interests, so that's out. In a couple of years I hope we'll have a way to send such a list, perhaps via packet or a sub-carrier, so it can be displayed on the screen on the other chap's rig. Better yet, a fairly simple processor in your rig could match your interests against his and highlight them on your screen.

Meanwhile, how are we going to get a real QSO started? Maybe this is insurmountable and we should just forget even trying to use amateur radio for meaningful communications. Perhaps we should just give up and use it for contests, DXing (which is a form of contest) and checking into nets where we've already known everyone for a long time.

Duplex

It's a shame that we didn't at least build our repeater systems so they'd work full duplex. Back before the FCC changed the rules, I used to love working duplex on 160m with four to eight stations all sitting there talking, just as we would in a living room. I think it was January 1938 they made that illegal. Oh, they didn't intend to . . . that was a by-product of their wanting to stop a handful of jerks who were broadcasting records for hours at a time. Yes, we've always had a good supply of jerks.

So the FCC dumped a rule on us which said all transmissions had to be for the purposes of communications. That scotched the records all right, but it also had the FCC monitors sending out pink QSLs for duplex contacts.

We could get back to duplex on our repeaters if we'd use two-band rigs. Then two of us could transmit on two 146 MHz channels and listen on 222 or 450 MHz. Anyone want to give it a try and write about it?

It would be much more difficult to do this on the HF bands, but if you separated your antennas a bit, you could work duplex from one end of 10m to the other . . . and probably 15m too.

I used to have a ball getting some fairly rare DX stations into a 75m net via my 20m station. I'd relay the 75m net on 20m for the DX station and then relay the DX station from 20m to 75 so he could talk to the net. It worked great and was exciting.

I got an FCC monitoring complaint about it once, but they backed down when I explained that (a) all my transmissions were for the purposes of communications and (b) I'd checked with the FCC in Washington before I did it.

As long as you've got at least two stations on one band you can legally work duplex crossband. A devious person might set up a duplex operation with another station and give the call of a fictitious third station just to give the facade of propriety.

But what about QRM, I hear you grumbling? Sure, that's a problem, but not an insurmountable one. Ten meters is essentially dead for many hours a day, so you wouldn't be likely to get much interference if you you used it for ground wave contacts. Fifteen meters will be dead more and more of the time as the sun spots fade again. Then there's poor old six meters, which has almost been abandoned.

It doesn't take a lot of ingenuity to set up a remote station on, say, 20m. It only has to be far enough away so your receiver doesn't block. I used to have my 20m station linked via a 2m repeater so I could operate it from anywhere around town via a 2m HT. That worked out fine, allowing me to make DX contacts while getting my morning exercise, climbing Pack Monadnock Mountain.

So let's use some imagination and get more fun into hamming. If you can start a movement toward duplex operation, you may be able to help us break the boredom barrier. Let me know how you make out. And let me know if duplex operating doesn't bring excitement and fun to your hamming.

Bad Mouthing the League

I got a letter last month griping that "I'm always bad mouthing the League." Let's mull that one over. Bad-printing would be a more accurate term for the perception.

When I get a letter like that I know two things. I know that the writer is (a) not a thinking person and (b) has a religious affiliation with the ARRL, not a rational one. Let me explain the situation.

As the dominant publisher in the ham field, the ARRL has, to my mind, a responsibility to do its best to keep the hobby healthy and make it grow. It's the League's failure at these two basic responsibilities which I deplore . . . and which I often comment on, offering constructive criticism.

In the music field my magazine, *CD Review/Music & Audio Reviews*, is as dominant as *QST* is in amateur radio, so I feel a responsibility as the publisher to help the music industry be healthy and grow.

When I was publishing computer magazines I accepted the responsibility that came with my dominance in that field and helped the field to grow with books, the first mass-produced software, a computer show in Boston and so on. None of these were big moneymakers, but I felt they were important for the growth of the industry.

In the music field the industry has been taken over by a cartel of six international megacorporations (mostly foreign owned) that now control over 95% of all music sales in America! That doesn't seem healthy to me, so I'm working to bring about some changes . . . as I mentioned in September. The music business is big enough so even 5% of it is significant, running to around $400 million a year in sales. My goal is to build that to maybe $4 billion.

In September I asked for hams inter-

ested in making some spare change as reps for my distribution company, Creative Music Marketing. We've already got a nice stack of applications, so we're in business.

Reps will help get my magazines, plus about eight other music magazines, which we also distribute, into record, music instrument, book, and hi-fi stores. They'll help us distribute music from several hundred independent record companies. They'll help distribute our "Adventures In Music" sampler CDs. They'll help get new releases played on local radio stations and reviews in local papers. It's a fantastic business for anyone who loves music, and should eventually pay off very well.

Just as I'm helping the music industry to grow and to clean up some of the dirtier aspects of the business . . . such as the radio payola which was recently documented by the best seller *Hit Men*, and a sorry lot of crooked distributors . . . I believe the ARRL directors should be working with every tool at their disposal to help us clean up the messes we have on our bands. I also believe they should make it their business to get the growth of amateur radio back to where it was before the League stopped it dead in 1964.

Yes, the no-code license, which the ARRL fought for years, has increased our growth, but it's still far short of the steady 11% growth we had in the 1945–1964 period. The League, if the directors wanted, could turn this situation around in a year. I've outlined what needs to be done many times . . . known as "League-bashing."

There was a wonderful article in the September issue of *Success* magazine on goal setting. "Every successful person is an obsessive goal setter." The article pointed to a study made of the 1953 Yale graduating class. They were asked (a) Have you any goals? (b) Have you written them down? (c) Do you have a plan for accomplishing them? Only 3% answered yes to all three questions. Twenty years later the group was surveyed again. The 3% who'd said yes were more happily married, more successful and had better health . . . and 97% of the net worth of the class of '53 was in the hands of that 3%. It's almost enough to make a person think.

Says *Success*: "You can go through life, or you can design one. If you have a plan, if you have a goal, then opportunities pop out in front of you. Most people spend more time planning their vacation than they do their life."

It also points out that, "Doing anything for money is instant failure," and "Studies show that 58% of Americans never read a non-fiction book once they finish school . . . the average person listed in *Who's Who* reads 20 books a year . . . now tell me who has the better chance at being successful?"

I've got all kinds of opportunities to use my guerrilla marketing approach in the music business because the six majors are run by financial guys, not music guys. The music industry is much like a third world country with a few very rich people and the rest in abject poverty. Of such conditions revolutions are made . . . and I'm starting one.

My *IMPS Journal* is read by 5,000 independent music producers. My *Music Retailing* is read by about 5,000 independent record store owners. These are the only publications reaching these groups regularly, so they give me an enormous advantage in mounting my guerrilla attacks.

If the ARRL directors would set up some goals . . . and then honor them . . . our hobby would benefit endlessly. They did set up a goal a while back to promote the hobby and bring about substantial growth. Then they did almost nothing to make it happen. How much credit should they take for the current spurt in growth? I've seen letters from Newington taking full credit for the no-code license. Before any HQ arms get broken with self-congratulation, there should be some admission that we'd have had no-code at least 10 years earlier if the ARRL hadn't fought it with every trick in the book. The League reluctantly endorsed the idea once there was no further way to stop it.

League old-timers are still griping to anyone who will listen . . . and not many will . . . that the no-coders will ruin the hobby. They're nothing but dumb CBers, they claim. These old turkeys stopped reading *73* years ago . . . if they ever did . . . so they don't know (and don't want to know) that the new no-code licensees are turning out to be some of our best operators. They don't know . . . and don't want to hear about it . . . that the newcomers are, almost to a person, getting busy learning the code so they can upgrade. Closed minds ward off such data.

As my grandmother used to say, "A man convinced against his will is of the same opinion still." Max Planck, who ran into the same problem with his quantum theory, said essentially the same thing. Some old-time scientists are still fighting quantum theory.

I keep Max's quote on my office wall. "A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die and a new generation grows up that is familiar with it." Keep that in mind as those doddering old-timers grouse about no-code at club meetings. They're old, so you'll be seeing them in Silent Keys ere long.

Of course, with the average ham age in the mid-50s these days, most of us are headed toward pulling the big switch. You can react to that news by giving up and making everyone around you as miserable as possible while you await your final blessing from the ARRL. Or you can say, hey, I've got to get moving and get some things done that need doing . . . set some goals and pursue them.

If helping to clean up amateur radio and get it growing by ousting the old guard ARRL directors doesn't appeal to you . . . and if you aren't particularly interested in helping me clean up the music industry and open it up for entrepreneurs . . . perhaps you can get your teeth into something else where you'll make a difference.

I'm active in the education field and I'm already making a small difference. The governor (NH) appointed me to the new Economic Development Commission to try and get New Hampshire back in the black. I've got some plans for helping our largest industry, tourism, grow . . . with a goal of doubling in the next three years. And I've got some educational plans which should bear fruit in about 10 years, attracting high tech entrepreneurs to the state.

If I can improve New Hampshire tourism, you can bet other states will soon follow suit. Ditto education. This is a perfect state for things like this in that it's small enough so it's easy to know the governor and other key players . . . like the richest guy in the state, who is also a good friend and supporter.

New Hampshire has always been progressive. We had the first aerial tramway in North America (1938). We had the first lottery. We've had two governors who became presidential advisors.

The current unemployment in NH has mostly to do with the high concentration of larger high tech businesses such as DEC, Data General, Wang and so on. Too much bet on fading technologies . . . too much on defense contracting. New Hampshire needs to actively attract small high tech entrepreneurial businesses if it wants to avoid future recessions.

Once the large companies falter they start laying off thousands of workers. This has a domino effect on construction, home prices, car sales and so on. It depresses everything. Entrepreneurs, on the other hand, are able to quickly adapt to changing technologies and ride each succeeding wave. It's far easier to be in front of a trend than to try and catch up later.

The microcomputer is making both the mainframe and the minicomputer obsolete. Anyone but the accountants running the big companies saw this coming years ago. Indeed, I wrote about that in my editorials 15 years ago, explaining exactly what I expected would happen . . . and it has.

What do I see ahead in the ham field? Either we accept the responsibility and force the ARRL to do what its charter says it should, or we're dead meat. We all know in our hearts that technology is rapidly making amateur radio a pathetic relic of the past. Sure, CW is fun. So is DXing. But do we really believe that we're going to be able to hold onto hundreds of billions of dollars of radio spectrum for the amusement of an aging group of old men? Old *white* men?

We either bring in youngsters by the hundreds of thousands and encourage them to experiment with new communications modes or we're goners, but just don't know it yet. Bill Hoisington was busy experimenting with new modes until he died in his 80s. He was at that since I first met him as W2BAV in 1948. Age is no excuse for vegetating.

Old-time readers will remember Bill's dozens of articles in *73* on building microwave transmitters and receivers using simple, inexpensive transistors and test equipment.

Ham Broadcast Service Coordination

Just as repeaters started sprouting throughout the VHF bands 20 years ago, we are seeing a ham broadcasting service starting to spread through our HF bands. And just as we found it critically important to set up voluntary repeater coordination to limit interference, perhaps it's time for coordination to help keep our ham broadcasting services from interfering with each other.

Some Basic Rules

Since the FCC has provided no real guidelines for this service, I'm going to propose some which seem reasonable to me. If you disagree, please let me know what you suggest as an alternative.

For instance, since it's so simple to set up a ham broadcasting service using a tape recorder that almost any ham can do it, I propose we agree up front to try to keep news broadcasts under one hour in the interests of spectrum conservation.

Of course our role model for ham broadcasting should be W1AW, which has been doing this with great success for decades. Few of us can hope to equal their incredible (and horrendously expensive) array of Harris commercial broadcasting equipment, but their computer control, which allows the station to be run with no operator present, can be easily emulated. Indeed, articles on software for this application will certainly be of interest.

In order to keep interference minimal, I suggest we plan to give broadcasters 10 kHz channels. Since K1MAN has claimed 14.275 kHz for his own on 20m, we can allocate from there on down the band, stopping at 14.225, which would give us seven channels. Once those have been allocated we might want to continue on up to 14.325, giving us five more channels. This could be a great solution to KV4FZ's continuing 14.313 garbage heap.

Once those 12 channels have all been coordinated, we'll need to consider a time-sharing system, with perhaps some transmitting on the even hours and the alternates on the odd hours.

But What About QRM?

First, the FCC regulations say clearly that it's necessary to check a frequency before transmitting on their self-assigned (commandeered) frequencies, whether anyone else happens to already be using them or not. Many nets operate on the same principle . . . that they are the primary users of the frequency and have an inherent right to them.

Once we have enough broadcasters in operation, most hams will probably be so busy listening to these interesting broadcasts that they will have little need to transmit, anyway. Thus, each ham broadcaster could easily keep hundreds or even thousands of other ham operators busy listening, thus reducing QRM significantly.

Material To Broadcast

The FCC regulations state that ham broadcasters must transmit information of particular interest to amateurs. This could include discussions of proposed rule changes. It could include technical discussions. It could include theory lectures and code practice to help amateurs upgrade their license grades. It could include DX and DXpedition information and lists of QSL handlers.

In fact, almost anything can be discussed, as long as even a remote connection is made to amateur radio. I'm looking forward to making tapes discussing in detail every one of my DXpeditions over the last 33 years. And for those of you with color slow-scan equipment, I'll have some nice color pictures of the DX stations and rare countries I've visited. I've got thousands of fabulous pictures.

There's no reason bulletins have to be all on voice, CW or SSTV, so I'm sure we'll be seeing RTTY, ASCII, and other computer-readable formats turning up.

Just as we have hundreds of ham nets, I'll bet we'll have special interest ham broadcasting . . . for ham doctors, lawyers, submarine vets, G.E. employees and ex-employees, UFOs, MAC users, PCers, and so on.

I hope we don't run into the problem we have with repeaters where we've almost reached a 1:1 ratio . . . one ham for each repeater. This at least has the benefit of keeping our VHF bands almost totally silent, other than for random automatic repeater identifications. The up side is that once we saturate our bands with ham broadcasters, we'll have less of a need for coordination, since everyone will be transmitting and almost no one listening.

Quality Counts

If you've been listening to the W1AW and K1MAN daily broadcasts, you already know many ways you can substantially improve on the services they are providing. For instance, you certainly don't want your broadcasts to be as deadly pontifical and humorless as those from W1AW. And please try to avoid those self-promotions and egregious ego-gratifications which characterize K1MAN's endless tirades.

You want your material to be interesting, amusing, and helpful to your listeners. After all, you're in the world of broadcast radio now and you win or lose your listeners not so much on the information content of your broadcasts as on their presentation. You're in show biz. Non-profit show biz, to be sure . . . much like our public radio systems such as NPR, APR and college radio stations. This means you'll build your listening audience more on your interpretation or slant on the news than on the news itself.

Data Services

With computers so ubiquitous, there's no reason not to include data transmissions at the end of voice broadcasts. I've suggested including slow-scan video so you can include illustrations . . . such as pictures of hams who have done something outstanding (good or bad) and their stations. You might show QSL cards from rare DX stations.

For greater illustrative detail, you'll want to go to desktop publishing technology and scan in things like schematics or magazine pages and send them as data. Music, too, can be sent as data, using the standard compact disc encoding format. Yes, you can legally transmit music this way!

Then there are items such as lists of hamfests, auctions, and other such club activities, contest schedules, rules and results from the hundreds of contests and awards around the world, data and comments on pending rule changes, even complete scanned-in club newsletters and foreign ham magazines. Wait'll you see some of the marvelous construction articles appearing in the Japanese magazines! The FCC's recent hints that it may no longer object to us selling ham gear over the air could open a whole new broadcasting and data arena.

Simultaneous Broadcasting

Ham broadcasters will want to emulate W1AW and K1MAN by developing their services to cover several amateur bands at once. This means buying more transmitters, but that's just more business for our ham industry. If hundreds or even thousands of ham broadcasters buy eight or 10 transmitters each, it'll do wonders to improve the ham industry economy. I don't recall any rules against transmitting on several frequencies in one band at the same time.

Paid Operators

Obviously a strong ham broadcast service will be more than can be accomplished with all volunteer operators. Ham broadcasters will have to operate seven days a week and at least around 12 hours a day. This is going to mean paid operators. Fortunately for us W1AW has set a precedent which, though it was patently illegal, has been accepted by the FCC for many years. It's legal to pay ham operators to broadcast. You can also pay them to write the material, record it and transmit it.

Unfortunately, that brings up something none of us want to talk about or admit to even obliquely . . . how to bring in the money it takes to pay a staff. Well, one way is to set up some sort of national or even international ham organizations and charge a membership fee.

Another might be to work a deal to innocently weave product mentions into your broadcasts. For instance, you might comment at length about how this or that famous DXer is awfully fond of drinking an ice cold, refreshing Coke when the going gets rough. Or that a ham luminary who will be giving a talk at the such and such ham club will be staying at the local Embassy Suites hotel, where they serve fantastically delicious breakfasts at no extra charge and have TV sets in both the living room and bedroom of their surprisingly inexpensive suites.

I'm sure our legendary ham ingenuity will find a way to circumvent what's left of our tattered regulations.

Special Interest

I suspect that many of the early ham broadcasters may, like K1MAN, be driven by emotional considerations more than by public service, so we'll probably be hearing ham broadcasters with special interests holding forth and slanting their material to support things like homosexuality, women's rights, women's choice, anti-abortion, rain forest preservation, tree hugging, baby seal protection, dolphin saving, education bashing, Christianity, Mormonism, Islam, world peace, famine relief, Libertarianism, and so on.

But, you expostulate, some of these things are pretty far afield from amateur radio. Is not to worry . . . that aspect of ham broadcasting has already been pioneered by W1AW. Far's I know, the FCC has never in all these years cited W1AW for addressing their broadcasting to non-amateurs. And what else would you call their code practice transmissions?

In my day, over 50 years ago, they were sending code practice at 13 wpm to help non-licensed listeners pass their first license tests. When the code speed was dropped to five per they lowered their practice speed. These transmissions clearly were not addressed to license amateurs. Thus we have at least a 50-year acceptance by the FCC of using our amateur bands for broadcasting to non-amateurs. I'd say that's a pretty clear-cut precedent.

Frequencies

With K1MAN tying up 3975, 14275 and 28475 six times a day (0745, 1100, 1300, 1700, 2100, and 0000 UTC) for 45 minutes at a time, newcomer broadcasters are going to have to go some to get ahead of Baxter. He even goes on AM on Sundays on 3890 and 7290 at 2300Z.

I like the idea of high fidelity AM transmissions. Yes, they sure do fill up a 10 kHz channel, but they're much easier for SWLs to tune in, possibly attracting new hams to our hobby from the listener ranks, since most inexpensive shortwave receivers aren't equipped to handle SSB.

Coordination

I will be glad to list ham broadcasting service stations, along with their frequencies and times, plus any special interests they may cover. Once listed in *73* they may then announce themselves as "Amateur Radio Official Broadcast Stations" (AROBS).

Am I Serious?

Yes, of course I am . . . this is a serious test to your credulity . . . just as the K1MAN transmissions are a test of your ability to put up with a massive waste of our frequencies and patience. 73

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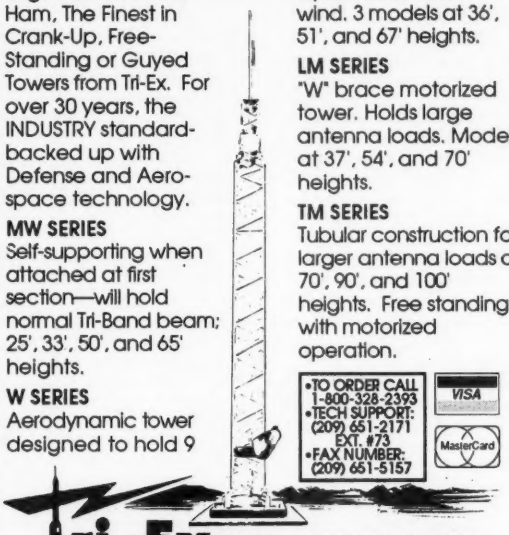

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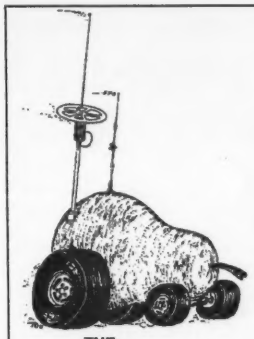

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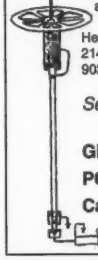

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RANDOM OUTPUT

David Cassidy N1GPH

It being December (even though I'm writing this in October), I wanted to write a quaint holiday story—maybe something about all those repeater groups who bring Santa Claus to kids in hospitals, or a tender and touching story from my childhood. I'm sorry, but I can't do that. There are a few things going on in our hobby right now that are too important to wait until January.

The Haller Hustle

FCC Private Radio Bureau Chief Ralph Haller (N4RH) announced at an FCC Forum held during the ARRL National Convention that the FCC is considering a rewrite of Rule 97.113. This is the rule that tells us what we can't transmit over amateur frequencies—business communications, messages for hire, broadcasting, music, etc. In a nutshell, what Haller proposes is to allow certain types of business communications on the ham bands. This would include such activities as coordinating public events and providing information for the news media, as well as personal business like ordering a pizza over a phone patch.

Haller stressed that this new "third type" of amateur communications (the first two being emergency communications and "all other" permitted communications) would be on a secondary usage basis, utilizing "unused Amateur Service frequencies."

This proposal scares me, and it ought to frighten you, too.

By accepting Haller's premise, we are agreeing with him that there is an excess of "unused Amateur Service frequencies." Do you really want to stand up in front of the FCC and say, "We have plenty of unused frequencies, and I'd sure like to help out my local TV station by providing a free business band."? You and I both know that once you allow use of amateur frequencies for business purposes, it is only a matter of time before those frequencies become full-time business frequencies. As soon as you make the amateur service a business service, you can kiss it good-bye . . . and this is exactly what Haller is trying to sneak by us.

The problem with a suggestion like this is that it SOUNDS great. To be sure, there are some communications services that currently fall under the gray area of "business" that might benefit both amateur radio and the recipients of those services. A club offering communications services to local non-profit groups (which hams have been doing for decades, anyway) would be a great PR tool for amateur radio. But ordering a pizza over a phone patch? Is that what amateur radio is all about? Don't be fooled by phrases like "secondary use" or "utilize unused Amateur Service frequencies." This is a smoke screen, set up to hide the fact that business interests in this country desperately want our spectrum. Every scenario of a business use suggested by Haller already has a radio service that can take care of it. The only thing that Haller's suggestion will do is allow businesses to get free communications services, with the amateur band equipment costing thousands less than comparable business band equipment.

Now that the subject has been raised, it is inevitable that we will have some sort of change to the "no business" rule. I suggest that we all take a very hard and long look at whatever is proposed. I urge you to send a very definite message to the FCC. Tell them, especially Private Radio Bureau Chief Ralph Haller, that you see right through this charade. Tell them that you do not believe there is such a thing as "unused Amateur Service frequencies." Tell them that the Amateur Radio Service must keep itself clear of any association with business communications.

If the proposed changes are in the interest and for the benefit of amateur radio . . . fine. But let them know that we are watching their every move to see exactly what is going to come out of all this.

You might want to mention that you are also well aware of PR Docket 91-170. Oh, you mean you don't know about PR 91-170? Please, allow me to enlighten you. PR 91-170 is a move, initiated by Mr. Haller's group, which could revise the land/mobile frequency spectrum in order to make room for new and developing technologies. How coincidental that Haller now suggests that perhaps business communications should be allowed on the amateur bands. Hmmm . . . do you think the two ideas could be somehow connected? Let's see . . . "take some of the frequencies away from land/mobile users to make room for commercial experimentation, and at the same time we can start suggesting that there is an abundance of 'unused Amateur Service frequencies' . . . and wouldn't it be grand if we could make those dumb hams think we were doing them a favor by allowing them to order pizza over an autopatch, while at the same time making it possible for other business communications to get a foothold on that frequency spectrum. Those idiot hams will be so busy stuffing their faces with autopatch-ordered pizza that they won't even notice that we're stealing amateur radio's birthright out from under their tomato-sauce-stained noses."

Mr. Haller, I have never met you but I am assured by those who have that you are a reasonable and concerned individual. I'd like you to remember that we amateurs are not stupid (at least not all of us, anyway). We can see through this silk purse for what it is—the ear of a swine. We do not buy for one minute that there are an excess of "unused Amateur Service frequencies." Your promise of "secondary use" is laughable. If you're getting letters from amateurs who want this kind of "regulatory relief," tell them to buy their way onto the land/mobile service or whatever service is appropriate to their intended use. If you feel that business interests need more frequencies, give 'em some of that 200 megahertz of excess U.S. Government allocation that isn't being used. If they feel like ordering a pizza, tell them to use the phone.

Why is it that every time the FCC runs up against a small group of boneheads in amateur radio—whether it's the BARF idiots, the illegal phone-patchers, or just a bunch of hams who have forgotten what amateur radio is supposed to be all about—why is it that the FCC always tries to wash their hands of the problem by giving away a piece of amateur radio's heritage, instead of what they should be doing with our tax dollars . . . stringently enforcing the rules?

I'm sick and tired of the FCC using the "no money" excuse for not doing their jobs. Money is tight everywhere, boys. It means you have to find ways to do your job better. It doesn't mean you can simply write off an entire area of responsibility by rewriting the rules to make a problem disappear. If I did that, I'd lose my job. When a U.S. Government employee or agency does it, it is nothing short of theft. You're stealing my tax money, and it really ticks me off! If you are unable to do the jobs the American people are paying you to do . . . quit! Get the hell out of the way and let someone who knows how to run a business in there. Just stop crying to us about how little money you have and how short-staffed you are.

To those of you who have requested this kind of a rule change, I ask that you sit down for 10 minutes and ask yourself . . . is ordering a pizza over your repeater worth the raping of amateur radio? If you still think this is a good idea, drop me a line and I'll send you your reward—30 pieces of silver.

ARRL Up To Their Old Tricks

When the FCC decided it couldn't deal with licensing the Amateur Radio Service anymore (once again, abdicating their responsibility with the feeble "no money" excuse), the ARRL saw its chance to grab some more power and coyly offered to handle the licensing for them. The FCC said sure, but you can't have a monopoly. The ARRL then said, "Forget it—if we ain't the only game in town, we don't want to play."

Well, we all know how things turned out. VECs popped up all over the country, and the ARRL had to swallow its oversized pride and enter the arena as one of many VECs.

A few years ago, it was suggested that special callsign requests could be handled in much the same way. A private organization could do all the work of passing out callsigns, and the FCC wouldn't have to bother their over-worked and underfunded heads about it. Again, the geriatric gulag at the ARRL saw the chance to grab a little power. "We'll do it! We'll provide this service for amateur radio. Aren't we just the most nicest, altruistic and caring organization ever? Oh, by the way, one small, insignificant point. We want the exclusive right to do this."

The FCC told the League to stick it. They suggested that if amateurs wanted special callsign allocation, a system similar to the VEC program could be set up, but the ARRL was not going to get the exclusive. You guessed it. The ARRL backed out, making it seem like the FCC was the bad guy for not letting the nice and only-thinking-of-us-hams ARRL give you a callsign with your initials in it.

Well folks, the Geritol set at the ARRL have done it again, only this time they were a lot sneakier about it. Incorporated into the wording of HR 1674, the "Federal Communications Commission Authorization Act of 1991," was the following:

The Commission for purposes of providing specialized, radio club, and military-recreation call signs, may utilize the voluntary and uncompensated services of an incorporated association of amateur radio operators with more than 100,000 dues paying members representing all States which has a tax-exempt status under Section 501(c)(3) of the Internal Revenue Code.

Gee, what organization does that sound like to you?

Luckily, Fred Maia W5YI got wind of this behind-the-scenes power grab and contacted the House Committee overseeing the legislation. The wording was changed to let *any* amateur radio organization authorized by the FCC act as a special callsign provider.

There are two issues at work here. The first is the sneaky way the ARRL got the original wording into the bill without the amateur community ever knowing. I thought the League was "of, by, and for the radio amateur."

Of course, the ARRL often forgets that they DO NOT represent the interests of the majority of hams in this country. The majority of licensed amateurs in this country are not members of the League. This is unfortunate, because amateur radio desperately needs a national lobbying organization. What the League leadership has become is an ineffective, self-perpetuating group of old men who lost their ideals years ago. The ARRL's sole reason for being has become of, by and for the ARRL. Is it any wonder that the majority of hams in this country have chosen not to join this joke of an organization?

The biggest crime is that there is no alternative organization, and neither should there be. The ARRL is, for better or worse, THE national amateur radio organization. This blatant power grab only goes to further prove how ineffective those old men are. I only hope that by the time all the self-serving and lifeless old farts who pull the strings at the League die off, there is an Amateur Radio Service still around to protect.

(Note to League officials who take offense at the above statements: Like my mother always said when she would yell at all four of her sons for something only one or two of us were responsible for, "If you didn't do anything wrong, then I'm not talking to you." Of course, the question always remains, if you didn't do anything wrong, why do you feel that I AM talking about you?)

(Note to readers who want to write me nasty letters and accuse me of "bashing" the League: This is America, and in America we are allowed to speak out when we feel something is wrong with our government. The ARRL is setting themselves up as the "government" of U.S. amateur radio. If you would like to debate the issues

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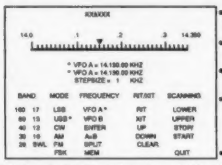
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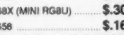

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CIRCLE 227 ON READER SERVICE CARD

involving ineptitude and lack of leadership at the ARRL, I would be glad to hear from you. If you are one of those people who thinks we should shut up and be grateful for the benevolent wisdom of those who are mismanaging our affairs, then please, keep your letters to yourself.)

The second issue that this whole affair brings up is . . . do we really want anyone other than the FCC handing out callsigns? I don't. If we want to change the current system and allow for the issuing of expired and special callsigns, the people who are being paid to do it are the FCC. Instead of writing a rule that gives the responsibility to someone else, why doesn't the FCC write a rule that allows them to charge a fee for the extra work involved in administrating such a program (though, why checking the database to see whether or not W1DC is currently assigned should cost anything is beyond me)? Most states offer custom license plates, and they charge a premium for the privilege. So why doesn't the FCC charge 50 bucks for licensing and renewing special callsigns? This would more than pay for the few seconds of effort involved in issuing the callsign, and the rest could be put into the FCC enforcement budget. Of course, then they wouldn't have any excuses for not doing *that* part of their job.

Broadcasting

Let's start this section with a few basic assumptions. Assumption number one is that the ARRL is a broadcaster, and they make these broadcasts with the express permission and blessing of the FCC. They can even pay someone to operate the station during broadcasts. This is all fine, and well, and perfectly legal.

Let us also assume that other people who broadcast on the amateur bands, such as K1MAN's endless propaganda, and the "Newsline" show I've heard a few times, and any other group out there who puts a ham radio news show on the amateur bands are operating under the same provision of the FCC rules, and as long as they operate within the regulations, everything is hunkey-dorey and nobody gets a "Notice of Forfeiture" from our pals at the FCC.

Let us also assume, because hams all over the country have adamantly voiced this opinion to me (though I certainly would never say such a thing), that Glenn Baxter K1MAN is one of the biggest horse's behinds in amateur radio. I hate to give little people like Baxter more publicity by noticing them, but this current crop of comedy from what locals have called "Maine's #1 embarrassment" is just too funny to let by without comment.

Baxter is currently fighting a $1500 fine. He was accused of starting one of his broadcasts on top of a QSO in progress, as well as some other stuff having to do with using the amateur bands to conduct business (gee, I wonder if he and Mr. Haller are buddies) and broadcasting to non-amateurs. Baxter's defense is that the ARRL does it, so it's OK for him to do it (Baxter goes on for page after page, but this is his premise in a nutshell). As long as he publishes his broadcast schedule and announces on the frequency that his broadcast is about to start, he thinks he's following FCC regulations to the letter.

Wrong! As my mother used to say (I hate to keep bringing my mother into this, but as often happens in life, when you're faced with a jackass, mom's brand of common sense is just the ticket), "Two wrongs don't make a right." Just because the League breaks the law by not checking to see if a frequency is in use, it doesn't mean that Glenn "all mike and no speaker" Baxter can do it, too. Glenn . . . rent a brain, buddy. You're wrong, and so is the League.

I have read and reread the FCC rule book, carefully going over the regulations that permit very specific types of broadcasting. Nowhere in those regulations does it give those who broadcast the right to break any other FCC regulations, including the rules regarding control operators, good amateur practice, and not causing willful interference. Those rules are still in effect, and the League, Baxter, and anyone else who wants to broadcast amateur bulletins should keep that in mind.

Baxter also claims that ARRL 5 wpm code practice is obviously aimed at non-amateurs, so it must be OK for him to direct broadcasts to SWLs and other non-amateurs. Well Glenn, that razor's-edge mind of yours has neglected one small paragraph in Part 97. Specifically, 97.111(b)(5) which states:

In addition to one-way transmissions specifically authorized elsewhere in this Part, an amateur station may transmit the following types of one-way communications: (5) Transmissions necessary to assisting persons learning, or improving proficiency in, the international Morse code.

Did you read that? It specifically says "learning." The ARRL is well within the law in broadcasting 5 wpm code practice, and I support the League 100% in this endeavor. It's one of the few programs that the League has enacted that is of a direct benefit to amateur radio. So, why is Baxter bashing the League? Do you think perhaps he had a slight problem with "Reading Comprehension 101" in school?

Glenn, pick up your ego and pay the damned fine. If you're not going to play by the rules, don't play at all. If you don't like the rules there are simple ways to suggest changes, but this ego-gratifying nonsense is getting you (and amateur radio in general) nowhere. It is only making us more enemies at the FCC.

The Baxter broadcasts that I have monitored have spent more time talking about Baxter himself than any other subject. Maybe I should heed the advice of those who tell me to just ignore this . . . er . . . guy. I've been told that his incessant babble only digs his own grave, because the more he talks, the bigger an idiot he appears to be (I don't waste my time listening to enough of his broadcasts to know, but this is what I've been told time and again from hams all across the country). The biggest favor Baxter could do amateur radio, and himself, is to shut up and go away. It appears that all he's doing is serving his own ends, not those of amateur radio, and judging from the hundeds of hams I've spoken with over the past few months, the vast majority of amateur radio operators are getting tired of listening to him. 73

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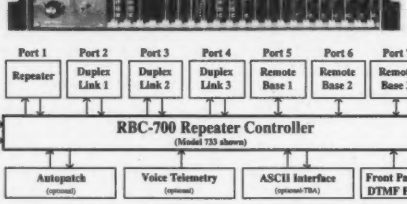

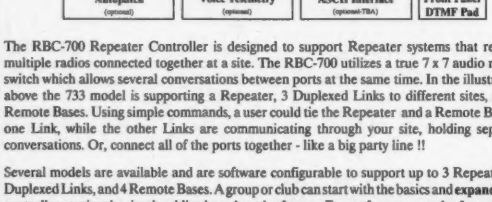

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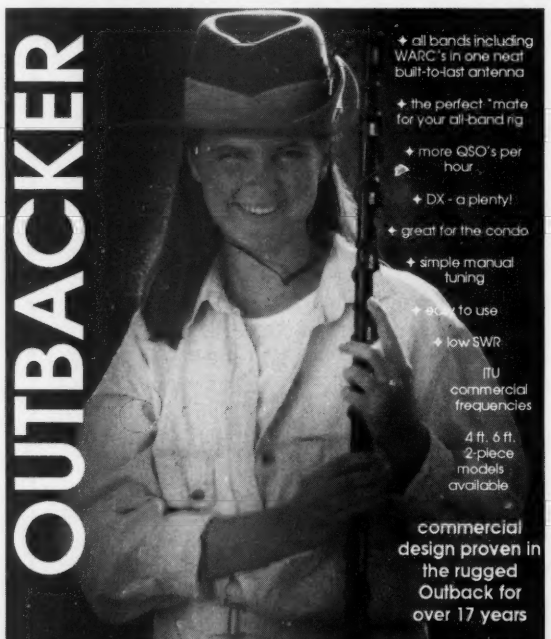

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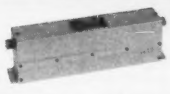

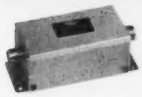

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The *73 Flea Market*, Barter 'n' Buy, costs you peanuts (almost)—comes to 35¢ a word for individual (noncommercial) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

Send your ads and payment to the *Barter 'n' Buy*, Sue Colbert, Forest Road, Hancock NH 03449 *and get set for the phone calls.*

Deadline for the March classifieds is Jan. 1, 1992.

HAM RADIO REPAIR CENTER, quality workmanship. Solid state or tube, all makes and models. Also repair HF amplifiers. A-Z Electronic Repair, 3638 East, Indian School Rd., Phoenix AZ 85018. (602) 956–3024. BNB220

WANTED: Yaesu FT-23R-HT and pre-1980 microcomputers for museum. KK4WW. (703) 231–6478/763–3311. BNB234

NEW!! NEW!! NEW!! NEW!! SPEAK TO THE WORLD Amateur radio language guide. •Written especially for the ham radio operator •Hundreds of phrases •Volume 1—incl. Spanish, German, French, Polish, and Japanese. •Volume 2—incl. Swedish, Italian, Portugese, Croatian, and Norwegian •Send $10.00 per volume in U.S. (all others add $2.50 S&H). **ROSE**, P.O. Box 796, Mundelein IL 60060-0796. BNB254

CHASSIS, CABINET KITS SASE, K3IWK, 5120 Harmony Grove Rd., Dover PA 17315. BNB259

HOME-BREW PROJECTS lists for S.A.S.E. Kenneth Hand, P.O. Box 708, East Hampton NY 11937. BNB264

QSL CARDS- Look good with top quality printing. Choose standard designs or fully customized cards. Request free brochure, samples (stamps appreciated) from Chester QSLs, 310 Commercial, Dept. A, Emporia KS 66801. FAX (316) 342–4705. BNB434

WEST, ARRL code tapes, Morse tutor for C-64, $25.00. Call Bill N1JQF. (603) 434–6497.BNB555

REVOLUTIONARY HYBRID AERIAL WIRE: 168-strand copper **"FLEX-WEAVE"** Tm, #14, strong, Ultra Flexible, ties in knots, nonstretch, won't rust/kink like copper weld, $34 first 275' (minimum), $.12/ft. thereafter, includes shipping! Catalog $1.00. DAVIS RF Co., P.O. Box 230-S, Carlisle MA 01741. (508) 369–1738 (orders) or (800) 484–4002, ext. 1356. BNB557

QUAD FIVE BAND $289.00 Lightning bolt antennas. RD 2 Rt. 19, Volant PA 16156. (412) 530–7396. BNB558

IN DALLAS SINCE 1960 We feature Kenwood, ICOM, Yaesu, AEA, Butternut, Rohn, amateur publications, and a full line of accessories. Factory authorized Kenwood Service Center. Electronic Center, Inc., 2809 Ross Ave., Dallas TX 75201. (214) 969–1936. (800) 880–9400. BNB559

COAX, GROUND RADIAL WIRE, lowest cost, top quality, MilSpec RG-213, $.38/ft.; RG-8X, $.19; RG-58, $.18; Mini Hardline low loss 10m to Belden equiv. RG-9913, $.39; any lengths. Radial wire #16, $38/1000 ft. includes shipping! Immediate shipment. Catalog, $1.00. DAVIS RF Co., P.O. Box 230-S, Carlisle MA 01741. (508) 369–1738 (orders) or (800) 484–4002, ext. 1356. BNB562

ANTENNA PROGRAMS design dipole, inverted-vee, quad; also labels, temp. conversion, guy wire lengths makes it easy to calculate wire lengths; 5.25 360K floppy for IBM compatible. $15.00 plus $3.00 S&H, Emil W8BVR, 6298 Old Allegan Rd., Saugatuck MI 49453. (616) 857–2507. BNB691

FINALLY! AT LAST! An adult mystery novel featuring a ham Navajo code talker. Hardback, $14.97. TJE Publications, Box 50141, Reno NV 89513. BNB700

ROSS' $$$$ NEW December (ONLY) MAIL ORDER PRICE SPECIALS: KENWOOD TS-450S $1,139.90, TM-631A $627.90, TR-8400 $339.99; BIRD 4304 $289.90, 500A $49.90; ICOM 24AT $384.90, 471H $879.90; YAESU FT-73RTT, $265.90, FT-470 $390.00; ALINCO DJ-F1T $274.90, EP-2010 $89.99; MFJ 207 $98.90, 815B $42.50. (OUR RETAIL SHOW ROOM WILL BE CLOSED FOR THE NEXT SEVERAL MONTHS. IF YOU WANT TO PICK UP SOMETHING, LET US KNOW 1 DAY IN ADVANCE.) CALL OR SEND 2 STAMPS FOR USED LIST AND MORE SPECIALS. LOOKING FOR SOMETHING NOT LISTED OR HARD TO FIND, CALL OR WRITE. Over 9039 ham-related items in stock for immediate shipment. Mention ad. Prices cash, F.O.B. Preston. HOURS TUESDAY–FRIDAY 9:00 TO 6:00, 9:00–2:00 P.M. MONDAYS. CLOSED SATURDAY & SUNDAY. ROSS DISTRIBUTING COMPANY, 78 SOUTH STATE, PRESTON ID 83263. (208) 852–0830. BNB707

EMERGENCY SUPPLIES: Disaster preparedness packs for your shack, auto, office, etc. Free catalog. Slates Products, P.O. Box 4375T, Walnut Creek CA 94596. BNB708

ROSS'$$$$ USED December SPECIALS: KENWOOD TS-930S/WAT/YG455C-1 $1,349.90, TS-830S $639.90, TM-731A $559.90, IF-10B $47.90; YAESU FT-ONE $1,299.90, 757GX $699.90, ADVANCED RADIO DEVICES 230A $3,799.90; DRAKE SL-500 $49.90, TR-7/NB/SL-2300,6000, 1800,500 $599.90; ICOM 701PS $109.90, R71A/EX-257, FL32A,30,70 $639.90, PS-15/CF-1 $144.90. LOOKING FOR SOMETHING NOT LISTED?? CALL OR SEND 2 STAMPS. WE HAVE OVER 140 USED ITEMS in stock. MENTION AD. PRICES CASH, FOB PRESTON. HOURS TUESDAY–FRIDAY, 9:00 TO 6:00, 9:00 TO 2:00 P.M. MONDAYS. CLOSED SATURDAY & SUNDAY. ROSS DISTRIBUTING COMPANY, 78 SOUTH STATE, PRESTON ID 83263. (208) 852–0830. BNB709

TRANSISTORS RF FOR SALE: MRF454, MRF455, Series Toshiba 2SC2290, 2SC2673, and more. Looking for repair shops, dealers, and manufacturers. Call (201) 839–3360. BNB710

SEIZED GOODS, radios, stereos, computers, and more by FBI, IRS, DEA. Available in your area now. Call (805) 682–7555, Ext. C-6223. BNB711

RECEIVER, CONVERTER 2-way radio equipment. Test equipment, antennas. Have lots & will ship! Phone for list—Rene VE6WCA. Ph/FAX (403) 438–3427. BNB712

BEAM HEADINGS: Computed for your QTH using extremely accurate Great Circle method. $7.00, Frank Santillo, P.O. Box 769, Newburgh NY 12550. BNB713

PREMIUM QSL CARDS Unique colorful designs, starting at $75 for 250. Send $1.00 for catalog and samples. BVE Professional Printing, 2023 Chicago Avenue, Suite B13-4, Riverside CA 92507. Tel (714) 781–0252. BNB714

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ELECTRON TUBES: All types and sizes. Transmitting, receiving, microwave. . . Large inventory = same day shipping. Daily Electronics, P.O. Box 5029, Compton CA 90224. (800) 346–6667 or (213) 774–1255. BNB719

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WE PRO-PRINT YOUR CALLSIGN on a button. Send $2.00 and SASE to: KC College Art, Inc., 14 Hillel Place, Brooklyn NY 11210. Marty/KB2LGC. BNB723

GIFT IDEA! Morse Code Music—see our ad in the ad index (under Kawa Productions). BNB724

MINIATURE POLICE RADAR TRANSMITTER one mile range, $41 assembled, $31.00 kit, (219) 489–1711. P.O. Box 80096, Fort Wayne IN 46898. BNB725

BUILD YOUR OWN WIRE ANTENNAS, parts, GROUND RADIAL WIRE, feedlines, various wire, insulators, vertical phasing, coax, Dacron rope, baluns, etc., LOWEST PRICES. Catalog, $1.00, DAVIS RF Co., P.O. Box 230-S, Carlisle MA 01741. (800) 484–4002, ext. 1356. BNB726

HAM RADIO REPAIR Experienced, reliable service. Robert Hall Electronics, 1660 McKee Rd., Suite A, San Jose CA 95116. (408) 729–8200. BNB751

WANTED: DAIWA CNW-319II antenna tuner, or any tuner that will tune both 6 and 10 meters. N5TSF (501) 329–3233. BNB755

WANTED: YAESU 726R Prefer 2m–6m–450 FM, but will discuss other. Must be excellent shape and clean—guaranteed or money back. Write (**ONLY**) to W9CGI Dave. All reasonable $$ will get reply. BNB756

WWII SHIP'S RADIO equipment now antique. Believed to be in unused condition. Send SASE for copy of name plate information. Craig Woods, 548 Simoron, Ogden UT 84404. BNB757

DIGITAL AUTOMATIC DISPLAYS. Kenwood, Yaesu, Collins, Drake, Atlas, etc. No bandswitching required. Business, 52¢ SASE. Be specific. GRAND SYSTEMS, Dept A, P.O. Box 3377, Blaine WA 98230. BNB758

ATHEIST AMATEUR RADIO NET forming. SASE for details. Beckett W9OE, 2003 Logan Apt. 2, Hamilton OH 45015. BNB759

X-BAND RADAR EQUIP. WANTED: Working or not, civilian, military WWII, 1970 especially need delay lines for AN/UPM11A. APS10,15 UPN4 AN/PPS4,4A, complete or parts, manuals older Varian X-band catalogues. SHF, Box 10215, Pittsburgh PA 15224. BNB760

GAINESVILLE FL QTH 3 BR, 2 BA, Garage, House on Acre. Tribander, tower, 160 inverted V, TVRO Dish, $60,000. W4OMG. (904) 495–2169. BNB761

WANTED: Ham equipment and other property. The Radio Club of Junior High School 22 NYC, Inc., is a nonprofit organization, granted 501(C)(3) status by the IRS, incorporated with the goal of using the theme of ham radio to further and enhance the education of young people nationwide. Your property donation or financial support would be greatly appreciated and acknowledged with a receipt for your tax deductible contribution. Please look over whatever unwanted equipment you may have, and call us. We will pick up or arrange shipping. You will receive the tax deduction, but most important, the privilege of knowing that your gift really made a difference in the education and upbringing of a child. You are invited to check into the WB2JKJ CLASSROOM NET, 1100 UTC on 7.238 MHz. The "22 Crew" would like to wish all our friends and supporters a wonderful holiday and super New Year. Write us at: The RC of JHS 22 NYC, INC., P.O. Box 1052, New York NY 10002. Round the clock HOTLINES: Voice (516) 674–4072, FAX (516) 674–9600. BNB762

HELP! N5AAN will be released from prison in April. I need a job, a place to stay, and relocation assistance. I have 3 FCC licenses and 8 years intense oilfield experience. I am factory trained on Mastr-II and Ferinon microwave/mux. For resume, write: Jim Cranford, 107159 S1-1, 27268 Hwy. 21, Angie LA 70426. BNB763

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INEXPENSIVE HAM RADIO EQUIPMENT. Send postage stamp for list. Jim Brady—WA4DSO, 3037 Audrey Dr., Gastonia NC 28054. BNB890

AMATEUR RADIO REPAIR!! All makes & models, any age. $20.00 per hour—maximum labor per unit, $80.00. TELO (Dan), 1302 S. Uplands Dr., Camano Island WA 98292. (206) 387–3558. BNB900

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WANTED: BUY & SELL All types of Electron Tubes. Call toll free 1 (800) 421–9397 or 1 (612) 429–9397. C & N Electronics, Harold Bramstedt, 6104 Egg Lake Road, Hugo MN 55038. BNB915

COMMODORE 64 HAM PROGRAMS—8 disk sides over 200 Ham programs $16.95. 25¢ stamp gets unusual software catalog of Utilities, Games, Adult and British Disks. Home-Spun Software, Box 1064-BB, Estero FL 33928. BNB917

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PRINTED CIRCUIT BOARDS for projects in *73, Ham Radio, QST, ARRL Handbook.* List SASE. FAR Circuits, 18N640 Field Ct., Dundee IL 60118. BNB966

AZDEN SERVICE by former factory technician. NiCds $36.95 plus shipping. Southern Technologies Amateur Radio, Inc., 10715 SW 190 St. #9, Miami FL 33157. (305) 238–3327. BNB979

COMMODORE 64 REPAIR Fast turn around. Southern Technologies Amateur Radio, 10715 SW 190th Street #9, Miami FL 33157. (305) 238–3327. BNB982

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AMIGA, MACINTOSH, ATARI XL/XE/ST Amateur radio and electronics PD software, $4.00 per disk. Send 2-stamp SASE for catalog. Specify which computer! WA4EFH, Box 1646, Orange Park FL 32067-1646. BNB992

FLAMEPROOF SIGNALLING KEYS USN, old stock, 1955, original sealed cartons; $57.00 each, Continental USA. SASE, Bunnell double speed key parts, etc. Joseph Jacobs, 60 Seaview Terrace, Northport NY 11768. BNB993

THE UNIDEN COOKBOOK covers HR-2510/HR-2600/HR-2830/Lincoln/Realistic HTX-100, $20; "Uniden Updates" supplements *T.U.C.*, $12. Money orders to: Bud, KC4HGH, POB 907, Satsuma AL 36572. BNB994

COMPONENTS QRO–QRP LSASE KA7QJY, Box 7970, Jackson WY 83001. BNB995

ROTOR PARTS ROTOR service, ROTOR accessories: Brak-D-Lays, Quik-Connects, Pre-Set mods. NEW models for sale. Free catalog. C.A.T.S., 7368 SR 105, Pemberville OH 43450. BNB996

SURPLUS Huge quantities. Lowest prices in America. Catalogs, $3. Surplus Traders, Box 276, Alburg VT 05440. BNB997

FOR SALE: SCHEMATIC DIAGRAMS for home projects. Write for free list. John Kolozsvari, 3055 Tomken Rd., Unit #304, Mississauga ONT L4Y 3X9 Canada. BNB999

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
P.O. Box 1079
Payson AZ 85541

A Few Good to Fair Days

December is another of the "doldrum" months on the HF bands, but there are some real advantages as well: The bands are generally quiet, with atmospheric noise from thunderstorms at a minimum. This means that 160 and 80 meters, along with 40 and some higher bands, ought to be good for both local and DX work. The higher frequency bands from 20 through 10 meters will either close before dark, or not be open much during the day under the worst conditions.

December is the month halfway between the equinoxes, and like June, it doesn't offer much HF opportunity on the 10, 12, and 17 meter bands. However, there will be some good days during the month as well as poor ones.

Expect the poorest conditions around the first day or two of the month, and again during the week of the 11th through the 18th. The remaining days can be good to fair, as shown on the calendar and time-band-country chart. On VHF there may be some cold-front propagation along boundaries of air masses having different densities and temperatures. Sometimes a weather map can be helpful in deciding where to point the 2 meter beam. Don't expect any 6 meter openings this month.

As I write (in August), the solar flux is UP again (surprise, surprise) between 250 and 300, and the A and K indexes are low. Hey, Sol, this is supposed to be the DOWN side of your cycle! What gives? To paraphrase an old saying: "A flare every day keeps the hams away." It has been true all year. So, keep your ears open for WWV at 18 minutes past each hour for an update of conditions, and a forecast for the following 24 hours. . . plus a synopsis of the past 24 hours. Great service, that!

A partial eclipse of the moon will take place on December 21, and can be seen in Iceland and Greenland, the arctic regions, the N.W. of S. America, N. America, the Pacific Ocean, Australia except for the extreme west, Asia except for the S.W., and extreme northern Europe.

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	—	—	—	—	—	20	20	—	—	—	—	15/17
ARGENTINA	15/17	15/17	20	20	—	—	—	—	—	10/12	10/12	10/12
AUSTRALIA	15/17	15/17	—	20	20	—	20/15	20	—	—	—	—
CANAL ZONE	20	20	20	20	20	20	20	15/17	15/17	15/17	10/12	15/17
ENGLAND	20	20	20/15	—	—	—	—	15/17	15/17	—	15/17	20
HAWAII	15/17	15/17	20	20	20	20	20	—	—	—	—	10/12
INDIA	20''	20''	—	20''	20''	—	—	—	—	—	—	15/17
JAPAN	—	—	—	—	—	20	20	—	—	—	—	15/17
MEXICO	20	20	20	20	20	20	20	15/17	15/17	15/17	15/17	15/17
PHILIPPINES	—	—	20	—	—	20''	20''	15/17	15/17	—	—	—
PUERTO RICO	20	20	20	20	20	20	20	15/17	15/17	15/17	10/12	15/17
SOUTH AFRICA	—	40''	20	20	20	—	—	15/17	15/17	20	—	—
U.S.S.R.	20	20/15	20/15	—	—	—	—	—	—	15/17	15/17	20
WEST COAST	15/17	15/17	10/15	10/15	40	40	40	—	20	15/17	15/17	15/17

CENTRAL UNITED STATES TO:

ALASKA	15/17	—	—	—	—	20	20	20	—	—	—	15/17
ARGENTINA	15/17	15/17	20	—	—	20''	—	—	—	—	10/12	10/12
AUSTRALIA	15/17	15/17	—	20	20	—	20	—	—	—	15/17	15/17
CANAL ZONE	15/17	20	20	20	—	20	20	15/17	15/17	15/17	10/12	10/12
ENGLAND	20	20	—	—	—	20''	—	—	—	—	15/17	15/17
HAWAII	—	—	20	20	20/15	—	20	—	15/17	15/17	15/17	10/12
INDIA	15/17	20''	—	—	—	20''	20''	—	—	—	—	15/17
JAPAN	15/17	—	—	—	—	20	20	20	—	—	—	15/17
MEXICO	15/17	20	20	20	—	20	20	15/17	15/17	10/12	10/12	10/12
PHILIPPINES	15/17	—	20''	—	—	—	20''	20''	—	—	—	—
PUERTO RICO	15/17	20	20	20	—	20	20	20	15/17	15/17	10/12	10/12
SOUTH AFRICA	—	—	20/15	20''	—	—	—	15/17	15/17	20''	—	—
U.S.S.R.	20	20	20	20	—	20''	—	—	15/17	15/17	15/17	20

WESTERN UNITED STATES TO:

ALASKA	15/17	20	20	20	20	20	—	20	15/17	15/17	15/17	15/17
ARGENTINA	10/12	15/17	15/17	20	20	—	—	—	—	—	10/12	10/12
AUSTRALIA	10/12	15/17	15/17	20	20	20/15	20/15	20	—	—	—	10/12
CANAL ZONE	15/17	15/17	20	20	20	—	—	—	—	15/17	15/17	15/17
ENGLAND	20	20	20	20	—	20''	—	15/17	15/17	—	—	20
HAWAII	15/17	15/17	20	20	40	40	20	20	—	15/17	15/17	15/17
INDIA	—	15/17	15/17	—	—	—	20''	20''	15/17	15/17	—	—
JAPAN	15/17	20	20	20	20	20	—	20	15/17	15/17	15/17	15/17
MEXICO	15/17	15/17	20	20	20	—	—	—	—	15/17	15/17	15/17
PHILIPPINES	—	15/17	15/17	—	—	20	20	20	15/17	—	—	—
PUERTO RICO	15/17	15/17	20	20	20	—	—	—	—	15/17	15/17	15/17
SOUTH AFRICA	—	—	—	20''	—	—	—	20''	15/17	15/17	—	—
U.S.S.R.	20	20''	20''	20''	—	—	—	—	—	—	—	20
EAST COAST	15/17	15/17	15/20	15/20	40	40	40	—	20	15/17	15/17	15/17

Notes: (1) Possible but rare dual bands (10 or 12, 15 or 17, 20 or 40). Try where shown. The highest possible bands shown. Also try next lower band at times shown.

DECEMBER 1991

SUN	MON	TUE	WED	THU	FRI	SAT
1 P–F	2 F	3 F	4 F	5 F	6 F	7 F–G
8 G	9 G	10 G–F	11 F–P	12 P	13 P	14 P
15 P	16 P	17 P	18 P	19 P–F	20 F	21 F–G
22 G	23 G–F	24 G–F	25 F	26 F	27 F–G	28 G
29 G	30 G	31 G				

HIGH PERFORMANCE PRESELECTOR-PREAMP

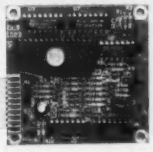
The solution to most interference, intermod, and desense problems in repeater systems.

- 40 to 1000 Mhz tuned to your frequency
- 5 large helical resonators
- Very high rejection
- Low noise—high overload resistance
- 8 db gain—ultimate rejection >80 db
- GaAs fet option (above 200 Mhz)
- Cast aluminum enclosure
- N, BNC, and SO239 connector options

Typical rejection:
±600Khz @ 145 Mhz: 28db
±1.6 Mhz @ 220 Mhz: 40db (44db GaAs)
± 5 Mhz @ 450 Mhz: 50db (60db GaAs)
±20 Mhz @ 800 Mhz: 65db
±20 Mhz @ 950 Mhz: 70db

AUTOMATIC IDENTIFIERS

- Up to 8 EPROM programmed messages
- Adjustable audio, speed & interval timer
- "ID over voice inhibit"
- Low power option
- Modular design
- Message selection via binary input—TTL levels
- Size: 2.7 x 2.6 x 0.7"



NEW Model ID-2B

The ID-2B provides required station identification without troublesome diode programming. The "ID over voice inhibit" circuitry allows for courteous operation by not allowing an ID until the next squelch closing.

ID-2B Wired/Tested $99.95 **ID-2B-LP Low Power $109.95**

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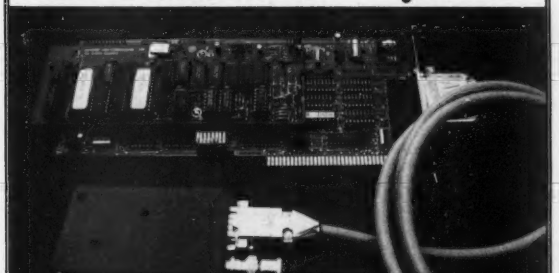
716-675-6740 9 to 4

CIRCLE 17 ON READER SERVICE CARD

the PackeTwin™ System



The PackeTwin data radio system, with integrated 9600 bps radio modem (G3RUH/K9NG compatible) and a 440 Mhz radio (*antenna* not included).

The PackeTwin is a high performance, dual-channel, sync/async PC interface card for data radio systems, with TCP/IP and AX.25 software (executable and driver sources provided.) Speeds of 1200 to 1 Mb/sec operation utilizing full duplex DMA. RS-422, RS-232, and TTL. The PackeTwin data radio is a single channel, half-duplex, crystal controlled unit delivering 2 watts output available in the 430-450 Mhz and 450-470 Mhz frequency ranges.

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Uncle Wayne's BookShelf

REFERENCE

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20N102 **Practical Digital Electronics Handbook** *by Mike Tooley* contains nine digital test gear projects, CMOS, and TTL pinouts and tables or reference data. Introduces digital circuits, logic gates, bistables and timers, microprocessors, memory and input/output devices, before looking at the RS-232C interface and the IEEE-488 and IEEE-1000 microprocessors buses. 208 pp., 100 line drawings. **$14.50**

20N103 **Electronic Power Supply Handbook** *by Ian R. Sinclair* covers many types of supplies—batteries, simple AC supplies, switch mode supplies and inverters. All types of supplies used for electronics purposes are covered in detail, starting with cells and batteries and extending by way of rectified supplies and linear stabilizers to modern switch - mode systems, IC switch - mode regulators, DC-DC converters and inverters. 144 pp., 90 line drawings. **$16.25**

20N104 **Electronic Test Equipment Handbook** *by Steve Money* is a guide to electronic test equipment for the engineer, technician, student and home enthusiast. Provides a practical guide to widely used electronics instruments and the techniques of measuring a wide range of parameters in electronics systems. 216 pp., 123 line drawings. **$18.00**

20N105 **Digital Logic Gates and Flip-flops** *by Ian R. Sinclair*, what they do and how to use them. Seeks to establish a firm foundation in digital electronics by treating the topics of gates and flip-flops thoroughly and from the beginning. For the user who wants to design and troubleshoot digital circuitry with considerably more understanding of principles than the constructor, and who wants to know more than a few rules of thumb about digital circuits. 204 pp., 168 line drawings. **$18.00**

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10M44 **World Atlas** *by Radio Amateur Callbook Inc.* 20 pp. of full color, 8¾" x 10¾", contains North Polar projection of the world; maps of all seven continents, West Indies/Caribbean area, and Pacific Ocean. **$5.00**

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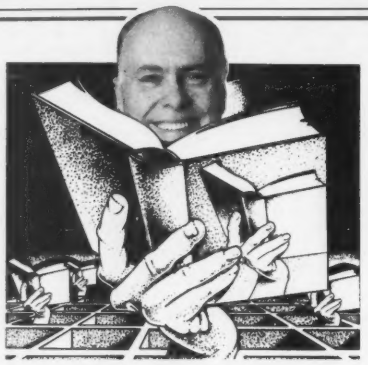

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12E76 **Basic Electronics** *Prepared by the Bureau of Naval Personnel* Thoroughly revised in 1972. Covers the important aspects of applied electronics and electronics communications. 567 pp. **$10.95**

12E41 **Second Level Basic Electronics** *Prepared by the Bureau of Naval Personnel* Sequel to *Basic Electronics*, thorough treatment of the more advanced levels of applied electronics, Includes microwave receiving and transmitting. Hundreds of excellent diagrams. 325 pp. **$7.50**

01D45 **The Illustrated Dictionary of Electronics, 5th Ed.** *by Rufus P. Turner and Stan Gibilisco* Featuring more than 27,000 entries, an exhaustive list of abbreviations, and appendices packed with schematic symbols and conversion tables, this is by far the most comprehensive dictionary of practical electronics and computer terms available. 720 pages **$26.95**

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03M223 **US Military Communications (Part 3)** This part completes the vast overall frequency list of US Military services, from 8993 KC to 27,944 KC. 78 pages. **$12.95**

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11T88 **Tune in on Telephone Calls** *by Tom Kneitel K2AES* Formatted as a frequency list with detailed description of each service and its location in RF spectrum. Provides basic information for casual listeners getting started and details for ardent enthusiasts. **$12.95**

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11SM11 **Scanner Modification Handbook, Vol. 1** *by Bill Creek* Provides straightforward step-by-step instructions for expanding the operating capabilities of VHF scanners. Filled with interesting text, helpful photos, tables, and figures. **$17.95**

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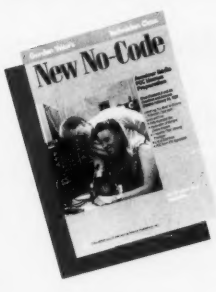

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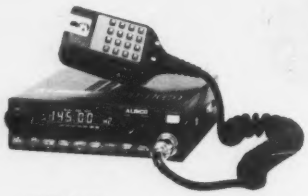
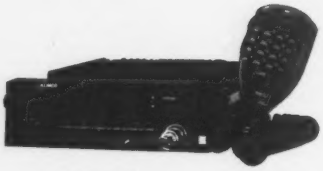


DR-110

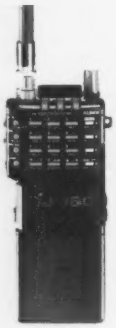
DR-570

DJ-120T



DR-590

DR-112



DJ-160T

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DJ-460T

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- Accessories/Options: FNB-12S (5 Watts) Battery, MH-12A2B Speaker/Mic, MH-19A2B Mini Earpiece/Mic, MH-18A2B Lapel Speaker and LCC-25 Custom Leather Case.

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Power Output: W/ FNB-17: 2.5 Watts (FT-411E); 2.0 Watts (FT-811); 1.0 Watt (FT-911) — W/ FNB-12S: 5.0 Watts (FT-411E); 5.0 Watts (FT-811); 1.0 Watt (FT-911)

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Case Size: 2.2(W) x 5.0(H) x 1.3(D) in.

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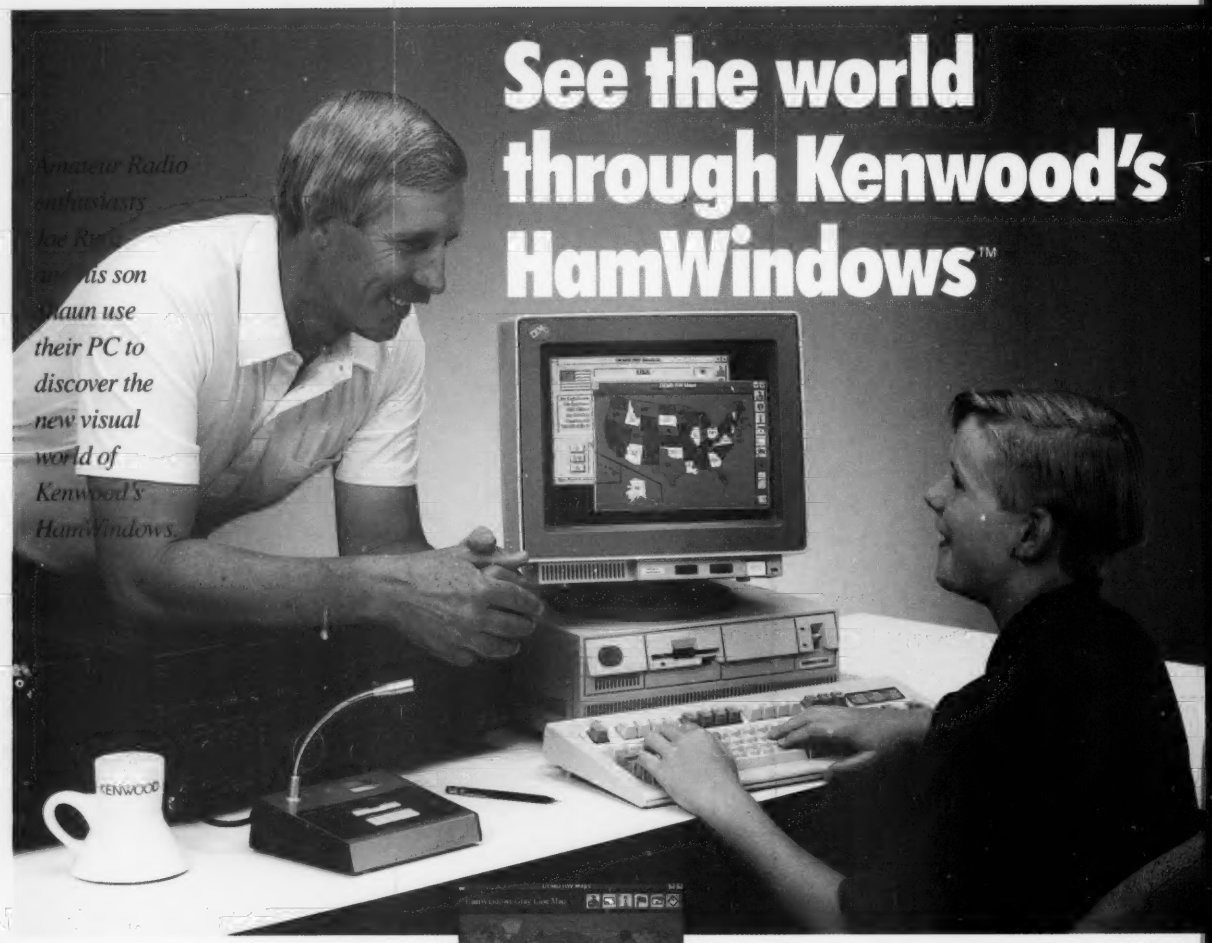
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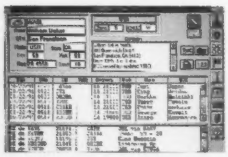

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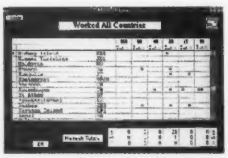

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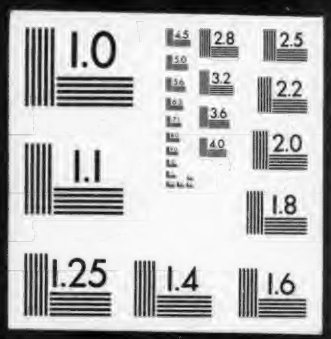
1.0
1.1
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3.2
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4.5
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